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THE ARMAMENT
OF THE
OUTSIDE LINE OF DEFENSE.

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SECOND ARTILLERY.

THE armament appropriate for the defense of a point of the coast depends, primarily, upon the character of the attack to which it may be exposed. This, in turn, depends on the hydrography of the approaches to the point from the sea, and of the water areas within gun-range.

While the depth of water on our bars and in the channels of our harbors up to within gun-range, determines in a fundamental way the nature of the attack to which the point may be exposed and the nature of the corresponding defense, there are certain points and sections of our coast line more liable to attack than others; such are commercial centres, localities of great wealth, points suitable for bases of military operations inland, good anchorages, etc.

If we direct our attention to our north-eastern coast from

Maine to New York City, it will be found that every important sea-port, and every vulnerable section of this coast offers sufficient depth of water in the approaching channels and neighboring waters to admit the most powerful ships of war of the world. The same may be said of the Pacific coast. But south of New York, on our eastern coast, there are no deep water-ways except Hampton Roads and Port Royal harbor.

In close relation to the fact that our deep harbors are along the New England coast, stands the further fact that this section includes our most important sea-port cities, and involves the entire train of commercial and industrial life that ebbs and flows through these as channels.

Thus it happens that our coast north of New York is open to the most powerful naval attack of the world, and invites such an attack by many natural and artificial inducements; its utter defenselessness serves to multiply these to an extent that must amount almost to a temptation to some powers.

It is evident that water-ways which admit the heaviest armor to float freely in, covering as it always does the longest range guns, must be defended with the most powerful weapons that can be made—taking full advantage of the fact that the dimensions and weights of guns on land need not be so restricted as those of guns on ship-board.

There will thus be always the possibility of mounting in our forts more powerful guns than can be floated against them.

This is a point that should not for one instant be lost sight of. We should not be content to return fire with fire of equal power, but, rather, insist at the outset, that *land-fire must be of a higher power than sea-fire.*

If a vessel carrying a single gun can steam to a point from which that gun can throw a modern shell—with possibly a high explosive charge—into a city, and be beyond the effective fire of its defenses, the consternation resulting will be almost as harmful as the surrender of the city; the first shell will cause the town to be cleared of women and children, the stores will be deserted and business generally will be paralyzed.

It is the function of the outside line of defense, therefore, to hold off all possible naval guns to a point beyond their extreme range from the city being defended.

If a ship be so protected by armor that she can stand without serious danger the blows of the projectiles fired against her, while

she fires overland into a city, the city derives no benefit from her defenses; the damage is being done despite the efforts of the defense; it amounts to the same thing as according to the naval gun, a range superior to the effective range of the shore gun.

It thus appears, that, in this field of outside defense, we must devote our attention to two fundamental questions, viz.:

I. What is the resisting capacity of modern armor to the impact of projectiles?

II. What are the extreme ranges of modern high-power guns?

In accordance with this division, and confining attention to the direct fire of guns solely, let us endeavor, first, to develop the relation that exists between the penetrating and smashing power of projectiles and armor-plate strength.

We find at the threshold of this question two distinct conditions of work that projectiles are called upon to perform, depending on whether armor-plate is made of wrought-iron, or of steel or compound armor.

Until comparatively recently, armor has been made of wrought-iron, and from long experience, and the accumulation of extensive data, fairly accurate formulas have been found giving the penetration of projectiles into this material.

Starting, however, with the success of the Cammel compound plate over the competing plates, in the trials of 1867, at Shoeburyness, and from the victory of steel over iron in the Spezia trials of 1876, an entirely new and different aspect has been given to ballistics of penetration.

The action of *pointed* projectiles against wrought-iron is a simple wedging action: the point easily enters the surface, and, then, the ogive head pushes aside the metal as the projectile moves on—the energy being absorbed in overcoming the cohesive forces of the molecules at, and in front of, the point of impact. The result of such impact is strictly local; when penetration is complete, the hole is clean-cut, and there are no cracks radiating from it over the face of the plate, nor is the surrounding metal heated. With flat-headed projectiles the action is like that of a punch cutting out a disc; in this case the molecules are torn apart throughout the thickness of the plate along the circumference of the shots' head.

In the case of modern steel and compound plates, however, the phenomenon of impact is quite different; here the effort of plate makers is to keep out the point of the shot by the superior

hardness and tenacity of the metal of the plate's face, and so thoroughly do the molecular forces support each other, that a blow at one point of the plate calls into action the metal for quite a distance around the point of impact. If the projectile possess superior hardness and tenacity to that of the face of the plate, it will penetrate the plate and in doing so will cut a more jagged hole than in the case of wrought-iron, and there will be radiating cracks from the hole over the face of the plate; and with steel plates, the metal will be heated by the energy of impact to a considerable distance about the point of impact.

The effect of projectiles against *steel* plates is not so much to penetrate as to *break up* the plate by causing partial, and then through cracks near and radiating from the point of impact, then, by subsequent blows, these cracks are developed still further until the pieces crumble off and expose the backing in rear.

With compound plates the action of the steel *surface* is the same as that just explained, and it is the object of the wrought-iron *body* of the plate to stop the cracks that will develop in the steel face and prevent them from extending through the plate. Once the projectile succeeds in breaking through the hard steel face, the rest of its passage is as explained for a simple wrought-iron plate.

We thus see, that, while it is the object of plate makers to keep out projectiles, break them up or deform them, making their energy perform work within themselves on impact, it is the aim of the projectile makers to have the molecules of their projectiles so *hold together* that there may be no change of form in the projectile—the projectiles either bounding back from the plate intact or passing through without deformity. The whole question seems to be drifting in the direction of the old "racking" theory, for, if plates be made so hard and tenacious that projectiles cannot enter them, it is clear we have "racking" effect only.

Of the many formulas that have, from time to time, been devised for penetration in wrought-iron, Froloff's is believed to be as serviceable as any; it has the advantage of being simple in form and more easily worked than most of the others, it is expressed as follows:

$$\text{For plates up to } 2\frac{1}{2} \text{ inches, } c = \frac{F}{576}$$

$$\text{" " above " " } c = \frac{F}{360} - 1.5 \text{ inch.}$$

in which F is what he calls "projectile force" and is equal to $\frac{w V^2}{d^2}$, in which w is the weight of the projectile in pounds, V the striking velocity in feet per second, and d is the diameter of the projectile in inches.

Another simple rule, and one fairly accurate, is that of Captain Orde Browne, Royal Artillery, as follows: the penetration of projectiles into wrought-iron is about *one calibre for each one thousand feet per second velocity*.

Some experiments have seemed to indicate that an allowance of from 25 to 30 per cent on penetration calculated for wrought-iron would give fair results for steel and compound plates, but the rule is not one that can be considered as established; the best results with steel plates would call for a much higher percentage allowance.

The data resulting from experiments against steel and compound plates, is not yet ample enough to reveal a law from which an empirical formula may be written out that will give in absolute terms the destructive effect of projectiles against steel and compound plates. It is clear as the effect of impact becomes more and more a "racking" effect, the basis of measure of the plate's strength and the projectile's power must be the *energy of the projectile*; and, therefore, for comparison of different plates, it is necessary to adopt a ratio between the total energy of the projectile and the weight of a certain quantity of plate. Thus it has come to be the custom to express a plate's strength by saying that it is able to bear so many foot-tons of projectile energy per ton of plate.

At this point a very interesting and vital question comes up, namely, *how much plate shall we consider as involved in the work of resisting the entrance of a projectile*. With wrought-iron we have seen that only the metal in front of the shot seems to be involved. As the percentage of carbon increases in the metal, there are a number of molecules around the point of impact that work actively in resisting, as is evidenced by the heat generated in the plate; this area seems to increase in direct ratio with the highness of the steel face, but, in the same ratio, there is a tendency to crack, and it appears, there will be a limit from this cause, as well as from difficulties of manufacture, to the quantity of carbon in plate metal. If we refer to the Schneider steel,* it

* Schneider plates as a rule contain about .4 per cent. carbon; the faces of English compound plates about .7 per cent. carbon.

will be noted that in the test of the armor plates for the *Amiral Baudin** at Gavre, March 7, 1884, Lieutenant Weyl observed that the plate was heated to a distance of about two feet around the point of impact so hot that the hand could not rest on the metal for some time; it is argued from this that for a distance of about two calibers† around the point struck, the metal participated in the work of resistance.

The naval ballistic tests for the armor of our new Navy require, that three shots be delivered near the middle of the plate at the vertices of a triangle, each side of which shall be in length three and one-half times the diameter of the shot to be used in the test. In Europe the ballistic tests of plates are of a similar nature, except that the sides of test-triangles in France and Italy are, as a rule, two and one-half calibers in length. If the lengths of the sides of test-triangles be so adjusted that a blow at one vertex will not fatigue the metal of the plate beyond a point half-way to the adjacent vertices, each shot will be resisted by the full normal strength of the plate.

From these facts, it seems fair to assume, that, with steel plates about twenty inches thick, of the present standard of carbon, the metal will not be called into active play much beyond three calibers from the point of impact. The general expression of the surface-area of active metal, on impact, will be a function of the thickness of the plate, the diameter of the shot, and the per cent. of carbon in the steel of which the plate is made.

Attention is here invited to the results of some actual trials of steel and compound armor plates, extracted from Table III, p. 48, "Report of the Board on Fortification."

On noting the size of plates, as given in the column of remarks, it will be seen that they are all greater in area than the three caliber limit above deduced, and it will be admitted, it is believed, that *the entire weight of each plate did not participate* in the work of resisting the projectiles; if the total energy of the projectile in each case had been divided by the weight of plate *actually involved in performing work*, the numbers in the column headed "energy per ton of plate" would have been much greater. In this connection attention is called to the last three trials, in which, owing solely to the small size of the plates, *viz*: 9'x4' 8", the energy per ton of plate runs up to over 1900 foot-tons per

* Plate 18.9" thick.

† Caliber of gun 12.6 inches.

TRIALS
OF STEEL AND COMPOUND ARMOR-PLATES.

PLATE.				PROJECTILE.				REMARKS.
Thickness. Inches.	Place and Date of Trial.	Maker.	Material.	Cal. Inches.	Weight. Pounds.	Kind.	Total Striking Energy Foot-tons	
9	Amager, '84.....	Morrel.....	Compound.....	10.	402.6	Krupp steel.....	5,556	Size of plate 6' 6"x4' 11". Point of pro- jectile struck at 25-in. distance of plate broken; 25-in. disk forced into back- ing. Shot broke up, found in backing.
11	Shoeburyness, '82.	Brown.....	".....	12.5	840	Cammell steel.....	11,824	Size of plate 10' 10"x5' 6". Shot broke up, point just at rear face of backing. Backing of granite. Size of plate 7'x7'.
12	Shoeburyness, '83.	Cammell.....	".....	16.	1700	Palliser chilled iron	39,000	Shot broken and pieces thrown back. No cracks, but other signs of weakness in the target.
18.9	Specia, '82.....	Schneider*.	Steel †.....	17.7	2000	Gregorini " "	21,090	Shot broken and pieces thrown back. No cracks, but other signs of weakness in the target.
18.9	".....	".....	".....	17.7	2000	" " "	33,100	Shot broken and kept out. Target cracked but still in good order.
18.9	".....	".....	".....	17.7	2078	Terre Noire steel..	34,280	Shot flattened and bounded back. Set up from 44.5' to 28'. Part of plate knocked off backing.
18.9	".....	".....	".....	17.7	2124	Gregorini cast and tempered steel.	33,670	Shot broken up, but went through plate and backing.
18.9	Specia, '84.....	Cammell.....	Compound.....	17.	1841	Krupp steel.....	44,660	Size of plate 11' 8"x10'. Shot broke up; plate split, but remained on backing.
22	Specia, '76.....	Schneider.....	Steel.....	17.7	2000	Gregorini chilled iron.	29,370	Shot kept out, put plate wrecked. Size of plate 11' 8"x10'.
27.56	Specia, '79.....	Terre Noire.	Cast-steel cov'd with 1-in. iron.	17.7	2022	" "	41,241	Shot rebounded, breaking into 200 pieces. Place of plate cracked off, leaving with only a slight swelling in the ogive. Plate admittedly inferior quality.
27.56	".....	".....	".....	17.7	2110	Whitworth steel..	49,666	Shot fell deformed in front of the target. Plate broken. Size of plate in the last three trials = 6'x4' 8".
27.56	".....	".....	".....	17.7	1946	Armstrong steel..	49,653	

* Size of plate 10' 10"x8' 7". Same plate used in examples 4, 5, 6 and 7.
 † 45 per cent. of carbon; oil tempered to a depth of 6 in.; hammered down from 7".
 ‡ This plate, 10' 10"x8' 7", bore successfully these three tremendous blows, the aggregate total energy being 88,230 foot-tons, or an energy of 2700 foot-tons per ton of plate. It gave way on the fourth shot, but broke up a cast-steel projectile in doing so.

ton of plate; these *Terre Noire* plates kept out two out of three 17.7 in. 2000 lbs. projectiles, yet it is well known that these plates were considered of inferior quality.

There is another plate trial, not mentioned above, to which attention should be specially called, as it marks a high order of plate strength, and one that fairly measures the ability of steel plates to keep out the best forged and tempered steel projectiles.

The trial was made at Spezia in October and November, 1884.* The object of the trial was to test the endurance of steel and compound plates. Three plates were presented, one all-steel plate by Schneider of Creusot, France, and two compound plates, one each by Brown and Cammel of England. Reference will be made only to the Schneider plate, as its resistance was superior to that of the other two.

The plate was 10 ft. long by 8 ft. 6 in. wide, and was 18.9 inches thick.

The programme of the Italian Commission was to fire first a 100-ton gun projectile at the center of the target, knowing that it would penetrate it, "the idea being to distress the plate as much as possible by the most powerful gun in existence, and then ascertain how much it would endure afterward from the fire of a gun more nearly equal to it."

The first shot against the Schneider plate weighed 1841 lbs.; it struck the plate normally in the centre with a velocity of 1860 ft. per second, giving a total energy of 44,880 foot-tons. The result of the shot was, that the projectile completely penetrated the plate, and *completely divided it into three parts by radial through cracks; each of these parts thus became a distinct plate for further firing.* The projectile after passing through the plate and backing, had little excess of power; a meniscus-shaped piece detached from the back of the plate by the projectile, fell at the foot of the target; fragments of the projectile, which was broken up, were found at the foot of the butt, a few feet in rear, into which the ogival point of the projectile had partly buried itself.

But interest is chiefly to be directed to the subsequent blows. As already stated the plate was divided into three distinct parts by the 100-ton gun projectile. One of the cracks radiated from the top of the shot-hole almost vertically to the top of the plate, the second passed from the bottom of the shot-hole to the bottom of the plate, being a continuation of the first, and the two together

* From the Report of Senator Hawley's Committee on Ordnance and War Ships.

almost equally divided the plate; the third radiated to the left almost horizontally from the center of the shot-hole to the middle of the left side of the plate. The *left half* of the original plate thus was made up of *two distinct parts*, each about *one-fourth the original plate*; the right half was intact.

The original plate weighed 29 tons. The two parts of the left half, therefore, weighed about 7.2 tons each, say 7.5 tons each.

In the subsequent firings each one of these left sub-divisions received at about its middle, a blow from a 10-inch B. L. Armstrong rifle. The projectile that struck the upper portion weighed 470 pounds, and reached the plate with a velocity of 2198 feet per second, giving a total energy of 15,580 foot-tons, or about *2077 foot-tons per ton of metal in the piece struck*. The following remarks are made in the official account after this shot:

"All the pieces of the plate remained in place. The rear of the target was entirely intact. The bolts were uninjured, and showed no signs of fatigue. The projectile was badly broken, the ogive remaining in the imprint."

The lower fraction, in like manner, received and kept out a similar blow from the same gun, the projectile weighing the same, its striking velocity being 2151 feet sec., and total energy 15,320 foot-tons, or *2042 foot-tons per ton of piece of the plate struck*.

The projectiles used in these tests were of Krupp's manufacture, of forged and tempered steel.

After receiving the 100-ton gun blow, and four blows from the the 10-inch gun, the backing still remained intact, as left after the first shot from the 100-ton gun, and it was estimated that "the plate and backing would admit of two more shots being fired," from the 10-inch gun.

Keeping in mind these tests, and the deductions above made, what shall be assumed as the strength of armor-plate in foot-tons of projectile energy per ton of plate, as a basis upon which further ballistic calculations may be established?

As a fundamental proposition it may be laid down, that our shore guns should not only be able to overmatch the *strongest plates now in existence* at ranges that would make our cities secure from shelling, but, if possible, they should *anticipate the development of armor strength in the immediate future*.

Considering that numerous cases exist in which plates have stood over 1000 foot-tons projectile energy per ton of plate without injury, that in a few cases armor-plate has shown strength as

high as 2000 foot-tons per ton of plate, and that improvement in the manufacture of armor-plate is moving at a gallop under the influence of a keen rivalry among several prominent plate makers, it does not seem prudent or safe to base an estimate that will determine the power of guns that must defend us for years to come, at a lower figure than *1500 foot-tons per ton of plate*.

It should also be remembered, that the normal point-blank fire under which plates have been tested, is a thing that will only be of the rarest occurrence in the actual work of the outside line; the ever-changing position of the vessels at which fire will be directed, and the curved shapes of armor plates will only accidentally bring the shot perpendicular to the armor on impact,—with these additional practical features in mind, it would appear, that, possibly, even a higher resistance should be granted to armor, than that assumed above. So powerful are these influences in action, that Noble, one of the ablest English artillerists, estimates that a thickness of armor equal to one-half the diameter of the projectile make a ship practically safe against the projectile.

Lieutenant Weyl, of the French navy, also calls attention to this feature in reminding us, that “in a sea-fight armor does not lose its power of resistance; the gun, on the contrary, loses much of its power.”

Having thus arrived at what seems to be a *fair* estimate of steel armor strength, let us look into the matter of the guns that must be used to perforate or overcome by “racking” such armor.

The first question that arises under this head is, what thickness of armor may be expected to come against us?

The Italian armored battle-ships *Ré Umberto* and *Sicilia* (now building) are to have steel armor 29.5 inches thick.

The Italian battle-ships *Duilio* and *Dandolo* have steel armor 21.67 inches thick.

The French battle-ships *Amiral Baudin*, *Formidable* and *Marceau* have steel armor 21.6 inches thick.

The English battle-ship, *Inflexible*, has 24 inches of iron armor. The *Nile* (now building) and *Trafalgar*, have 20 inches compound armor. The *Rodney*, *Howe*, *Benbow*, *Camperdown*, *Anson*, *Colossus*, *Edinburgh*, *Renown*, *Sanspareil*, all have 18 inches of compound armor.

There are a number of other battle-ships belonging to each of the first class powers of Europe carrying steel or compound armor below 20 inches and above 15 inches thick.

There is a decided feeling abroad that the matter of armor has overstepped its proper limits in the first-named Italian ships, and there appears in this connection a tendency to stop at about 20 inches of armor. The weight of armor so increases the draught of ships, reduces their speed for a given horse-power, and impairs their handiness in action, that there is a tendency to regard these last-named qualities of more importance than mere dead weight of armor; at least this is the feeling with respect to battle-ships of the line. Furthermore, the armor, if very thick, encroaches unduly on the interior ship space, and renders it a difficult matter to work the many quick-firing and machine-guns now carried by ships of war, as well as the large caliber guns of high power, with their immense length of chase.

From these considerations it seems reasonable to assume twenty inches of steel armor as the limit upon which to base further work.

There is a limit also to the size of guns that can be carried on ships to be used for the general fighting work. The weight of large modern guns is so great, and their length so extended, that beyond a certain point their presence on a war-ship would so operate—by absorbing tonnage and ship space, depriving her of other kinds of fire, and reducing the effectiveness of the fire in ordinary actions at sea—as to subject her to real danger when opposed to the rapid-firing small caliber breach-loaders of the modern man-of-war.

It is not believed that guns much larger than the 100-ton guns now carried by the Italian ships will be found practicable for naval use. These guns are about 17 inches in diameter of bore. To be within reasonable limits let us add one inch to this limit of caliber, and *assume that guns larger than 18-inch caliber will not be floated against the defenses of our sea-coast.*

Let us now turn back to the *fundamental principle* of coast armament, viz.: that shore-fire must be superior in weight to ship-fire. Under this rule, how much superiority can be given to our land armament? It will always be desirable to mount on the outside line the highest power gun that the manufacturing ability of the time can produce, for the reason that the greater the excess of power of land-fire over water-fire the longer will the guns mounted be serviceable by anticipating any development of armor strength and gun power that may take place. This reason has special force at the present time, for, while it is true that no

larger or heavier guns will likely be brought against us, it is also true that, with present weights and dimensions, the next few years will likely see a great development of gun *power*. Further, the larger the gun that can be mounted, up to a certain limit, the cheaper it will be to defend the coast, for the *effective area* guarded by guns varies with the square of the *effective range* of guns; the cost of making and mounting guns does not begin to increase in the same ratio, and, moreover, the larger *effective area* means *fewer men* and *fewer forts*.

Krupp is to-day making a 17.5 inch 150-ton gun. The English have designed a 19-inch 156-ton. Captain de Brynck of the Russian Marine Artillery, for some time supervisor of construction at the Russian Obouchoff Gun Works, and founder of the de Brynck system of guns, recently adopted by Russia, "claims to be able to build a 250-ton 20-inch gun with a 20-ton hammer." (There is now building at Perm, a 12-in gun on this system with a 14-ton hammer). The Pittsburgh Steel Casting Company will, according to the statement of one of its officers, contract for a 110-ton gun at any time. It has been stated that if desired, the Armstrong Works could turn out a 200-ton gun.

We are, therefore, led to believe, that, if it were called for, the gun-makers of Europe, and perhaps of this country, could produce a 20-inch gun; it is sure to be a possibility, before any real work is likely to be done in this country in the direction of arming our outside line.

Therefore for the purposes of this discussion, a 20-inch gun is assumed as the standard gun for the defense of our outside line.

This will give shore-fire the benefit of all the advantage flowing from a caliber two inches greater than that of the largest gun that will likely be floated against us.

What will be the relation existing between the power of such a gun and the strength of a 20-inch steel armor plate?

If we assume the projectile of such a gun to be 4 calibers long and, in form, similar to Krupp's projectiles, it will weigh about 4500 lbs.

From our previous argument, it will be reasonable to assume that the blow of such a projectile against a 20-inch steel plate would call into play all the metal of the plate surrounding the point of impact within a surface area of 10 feet square.

If we consider the plate to average about 490 lbs. per cubic

foot (which is the usual weight of steel), the weight of a volume 10 ft.x10 ft.x20 in. would be about 37 tons. If we consider this plate to have a power of resistance equal to a projectile energy of 1500 foot-tons per ton of plate, it will require a total projectile energy of at least 55,500 foot-tons to destroy the plate.

It would require a velocity of 1333 f. s. in the 4500 lb. projectile to give to it an energy of 55,500 foot-tons.

If we grant to our assumed projectile an initial velocity of 2000 f. s.—a very reasonable limit—it will have a remaining velocity of 1333 f. s. at a range of 11,806 yards, or about six miles. This, then, is the range at which the destructive effect of the projectile would be equal to the resisting capacity of the plate; within this limit of range the gun would overmatch the plate, beyond it the plate would have the advantage.

The following table shows how the most powerful existing and proposed guns stand as to effectiveness against such a plate.

COMPARISON

of the effectiveness of the most powerful existing and proposed guns, against a 20-in. steel plate having a strength equal to a projectile energy of 1500 foot-tons per ton of plate.

Gun.	Weight of Gun.	Caliber. (Inches.)	Weight of Projectile (lbs.)	Initial Velocity (f. s.)	Initial Energy (foot-tons.)	Striking velocity necessary to give a total energy of 55,500 foot-tons.	Range in yards at which projectile will have a total energy of 55,500 foot-tons.
Krupp.....	119-ton.	15.75	2300	1900	57,553	1865*	448*
Elswick (proposed).....	110-ton.	16.25	1800	2200	61,260	2108*	753*
American (Fortification Board, proposed).....	100-ton.	16.0	2300†	2000†	65,342*	1865*	1660*
Krupp (proposed).....	150-ton.	17.5	3300‡	1950†	88,678*	1543*	665*
English.....	156-ton §	19.0*	2900*	2200†	97,000§	1660*	673*
Gun herein proposed.....	200-ton.†	20.0†	4500*	2000†	124,933*	1333*	11,806*

* Calculated.

† Assumed.

‡ See U. S. Naval Intelligence Office Publication, No. VI., July, 1887.

§ See page 37, Report of Fortification Board.

Other data taken from published results of actual trials.

From this table, it will be seen that the gun herein suggested is decidedly more powerful than any gun yet made or proposed. It should by all means be our aim to secure such supremacy of fire as this gun would give. We have seen that the making of such a gun is within the manufacturing ability of existing gun establishments, and that no criticism is to be laid at its door on the score of expense, but, on the contrary, it will be cheaper to defend our coasts with such guns than smaller calibers. The increase of weight and size over smaller calibers is no objection in

a shore-gun, since, with modern mechanical appliances, guns of this size could be maneuvered with more ease and fired with greater rapidity and accuracy than our present eight-inch muzzle loaders are operated by hand. If our coasts *are* to be defended, there would seem to be no good reason why we should not possess twenty-inch guns.

It is proper to call attention to the small effective range of the 16-inch gun, since such a gun has been recommended by the Fortification Board as the largest caliber necessary for the defense of our coast. In the table we have given the 16-in. gun a 2300 lb. projectile, which is a most liberal allowance, and a muzzle-velocity of 2000 f. s.; both of these are greater than the Board credited its gun with, yet it is likely 16-in. guns will have this ballistic power within the next few years, even if it be excessive for the present, and wherever we can see development ahead we ought to anticipate it in our calculations. With this liberal ballistic allowance, the 16-in. gun will not be effective against a 20-in. steel plate at one mile range. (See table.)

Now, when it is known, as will appear hereinafter, that there are places along our coast where vessels can stand from two to four miles from land, and yet be within shelling range of our most important cities, it will be seen that under these conditions we face a possible failing case of 16-in. guns in coast defense. Any number of 16-in. guns would not protect a city exposed to shelling from a war-ship covered with 20-in. steel armor, or over, if that ship should stand beyond two miles from shore.

On the other hand, there is not a port on our coast of any importance that could not be amply protected from shelling by shore batteries mounting 20-in. guns with their six full miles effective range against twenty-inch steel armor.

It may be thought by some that six miles is so long a range that lack of accuracy would creep in to defeat an effective defense by 20-in. guns; but, if so, such persons can hardly be informed as to the marvelous accuracy of recent guns, especially guns of large caliber. It is an axiom of ballistics that, all other things being equal, a large projectile will deviate less from its trajectory than a small projectile, since it is not so susceptible to the minor perturbing influences of the atmosphere. It will be instructive to refer to some actual examples:—

In the Meppen trials of Krupp guns, in 1879, the 71-ton gun put consecutively the centers of eight projectiles within a parallel-

ogram 5 ft. 8 in. wide by 19 inches high, or smaller than the space occupied by one man in ranks, this at a range of over a mile and a half—2700 yards.

A 4½-inch field-gun in the same trials, using a projectile of less than 30 lbs. weight, was fired under a high angle of elevation at a target 10,300 yards—about six miles—distant. Such a light projectile, fired so high, and being so long in the air, must necessarily have been much more affected by atmospheric influences than a projectile weighing two tons would be, yet this small gun put fifty per cent.—five out of ten—of its projectiles within a parallelogram 80 yards long by 20 yards wide, or about the area of the deck of a large ocean steamer.

The 8-inch B. L. rifle of the Ordnance Department has put the centers of ten consecutive shots within a circle having a radius of 1¼ yards—about the size of an ordinary lunch table—at a distance of 3,000 yards.

Nor will the motion of ships fired at be so great as to prevent hits being made. It is right here that the service of sub-marine mines comes to the aid of shore-guns. For fear of destruction, ships of war must go creeping along under the fire of the guns of the fort, feeling their way through the channels and dangerous water areas, striving to cut a pathway out through the labyrinth of mines; thus held, as it were in a vise, by the torpedo feature of coast defense, guns can be worked with real effect.

Progress made and making with telescopic sights, such as the Zalinski sight, for instance, comes in to still further increase accuracy of fire at long ranges.

It may be stated as a fact, that it is not a difficult matter to hit the side of a ship, of the size, say, 250 feet by 25 feet, at six miles range, with first class modern guns of large caliber.

Having thus considered the shore-gun with respect to the ship as a target, in which case the work to be performed is overcoming the armor of the ship, let us now consider the ship-gun with respect to the city as a target, in which case the work to be performed by the gun is giving a maximum range to its highly charged shell.

A recent writer on this subject assumes that the extreme range of ship-guns will not much exceed eight miles; that, for instance, vessels must steam into the Lower Bay of New York before Brooklyn or New York will be in danger of shelling.

This assumption is based upon the further assumptions that :

1. naval guns can not be fired at a higher elevation than 20° aboard ships, and, 2. that there are no guns now in existence, or likely to be made, that will exceed the range of eight miles at this elevation.

It is said that ship gun-carriages will not permit a higher elevation than 20° , and, if they did, the ship's deck could not stand the strain of the recoil. It so happens that this assumption is already overturned by the French, who are making gun-carriages of the "Canet" pattern, admitting of 28° elevation, for their latest designed war-ships.

If 28° can be used it is a short step to 30° . Is it not unsafe to base such important calculations as those that go to render a city safe from bombardment, on so low a limit of elevation as 20° ?

Inasmuch, however, as the ranges of naval guns are usually referred, at the present time, to 20° as the extreme elevation, and since, further, it does not affect the bearing of the deductions made and to be made herein, let us, for the sake of argument, accept 20° as the elevation to be used in arriving at the extreme ranges of naval guns.

It should not be assumed that the present power of guns will not be increased; that with the same diameter it will not be possible to secure a higher muzzle and striking energy.

The ballistic elements of some of the highest types of gun development of to-day is given here.

Maker.	Caliber inches.	Weight of Projectile lbs.	Length of Projectile cals.	Initial Velocity f. s.	Range at 20° Elevation yds.	Powder lbs.
Krupp.....	15.75	2240	3.5	1835	13,864	730
"	12.0	1093	3.5	1857	12,866	357
"	9.0	475	4.5	1791	11,441	150
Elswick.....	16.25	1800	3.0	2215	15,539	900
"	15.00	1700	3.0	2100	14,326	880
"	13.5	1250	3.0	2050		625
Royal Gun Fac... (wire).	12.0	890	3.0	2100	13,823	450
"	9.9	380	3 —	2520	14,464	330
"	9.2	380	3 —	2530	11,912	200
"	8.0	210	3.0	2030	10,402	100
"	6.0	100	3.0	1964	9,406	54

(From Report of Fortification Board.)

A cursory examination of this small table is sufficient to convince one that the present state of gun power is not a stable one.

but that there is, on the contrary, every indication pointing to a higher development. If we compare in a general way, English ordnance with Krupp's, we note at once that the English seek to secure energy in their projectiles through *velocity*, whereas Krupp endeavors to reach the same through *weight* of projectile. While therefore we see from the above that the English charge of powder averages in weight about one-half the weight of the projectile, Krupp's powder charges do not exceed one-third the weight of the projectiles fired. On the other hand, while Krupp's projectiles are *from four to four and a half* calibers long, the English projectiles rarely run over *three* calibers in length.

If Krupp can be induced to have sufficient confidence in his guns to fire the English charges behind his projectiles, or if the English can be induced to fire in front of their charges projectiles from four to four and a half calibers long, keeping up the ratio of the weight of charge to weight of projectile to one-half, or even bringing the two weights closer together, it is evident that a long step forward will have been made.

We have already seen that it is not likely that guns larger than 18-inch caliber will be floated against us. For the sake of argument, and to work within the field of development just pointed out, let us assume the good features of the English and Krupp practice to be combined and attained in an 18-inch gun. Under this hypothesis we shall have a projectile 4 calibers long, weighing about 3500 pounds, having an initial velocity of about 2100 feet per second. The range of such a projectile with such a velocity at 20° elevation will be 17,851 yards, or 10.14 miles.*

In making calculations for guns for the defense of coasts that will not, under the most favorable circumstances, be mounted within six to ten years, we should be prepared to meet a gun having a power such as the above.

If we look further to the possibilities of gun power as evidence in the 9.2-inch wire gun of the English, which fires *330 pounds of powder* behind *380 pounds of steel projectile* giving a range at 20° elevation *500 yards greater than Krupp's 15.75 inch 119-ton gun*, we shall be able to see clearly that, to say the least,

* The determination of this range and other ballistic calculations of this paper have been worked under Siacci's method as given by Captain James M. Ingalls, 1st U. S. Artillery, in his work on "Exterior Ballistics." Captain Ingalls' rule of "Double Position," as given on page 112, is of unusual value in the solution of range problems like the above.

it is impolitic to base our calculations for armament on the assumption that, with present weights and calibers even, gun power will not increase.

The conclusion is reached that our seaport cities should be defended from shell fire throughout the area included within a circle described from the city as a center with a radius of not less than 10 miles.

Let us now apply the above deductions to our coast-line from Maine to New York city.

As to locations of guns, it will be impossible to do more than indicate in a general way the points at which forts or batteries should be established; the details of gun emplacements and the number of guns needed will not be taken up.

THE COAST OF MAINE EAST OF PENOBSCOT BAY.

No serious attack will likely be made east of Penobscot Bay. The absence of population, commercial and agricultural wealth, roads, railways, and all other ordinary interests, make it impossible for any due advantage to come from such an attack, and warrants passing over this section of our coast. Eastport, the principal city in this section, abuts upon British waters, and is within shelling range of British territory; about all that could be done here, would be to arrange a good torpedo defense.

THE PENOBSCOT BAY.

The defense of this bay involves that of Rockland, Belfast, Bucksport, and Bangor—all important fishery or lumber centers. The occupation of this body of water and the control of its western shore would afford an excellent base for a maritime enemy to land an army for operations to the west. Separate lines of railroads run to the west from Rockland, Belfast, and Bucksport. Basing on Rockland, an army could move along the coast to Waldoboro, to Wiscasset, to Bath, the fleet moving along, parallel, would aid in reducing these places in succession, and new subordinate bases would be made of each on capture. At Bath the Maine system of railroads would be threatened, and if turned by the capture of the junctions near Bath, the entire country to the north and east would be cut off.

In the same way if a force be landed at Belfast, by moving along the railroad to Burnham, it would cut off Bangor and Bucksport.

It would therefore seem to be proper to close Penobscot Bay if possible.

It is twenty-four miles across the mouth of the bay; but North Fox Island occupies 7.75 miles of this distance, and Deer Island 5.25 miles, making a total interval of land of 13 miles, and leaving but 11 miles of water to be closed. Of this 11 miles, 5.5 miles are between Owl's Head—the western point of land entering the bay—and North Fox Island; a second channel called *Isle au Haut Bay*, lies between North Fox Island and Deer Island, this is about 5 miles wide; a third, called *Eggemoggin Reach*, makes up the remaining distance to the mainland, this is about one mile wide.

The maximum distance between land points being thus but 5.5 miles, would require a ship to run within a 2.75 miles' range in passing in. It is therefore easily within gun power to close the bay; one emplacement at Owl's Head, and one on the west point of North Fox Island would close the western channel; one on the eastern point of North Fox Island, and one on the western point of Deer Island would close *Isle au Haut Bay*.

Eggemoggin Reach can be closed by a single emplacement, or could be made impassable by sub-marine mines.

The only armaments recommended for these waters by the Fortification Board is three 10-in. guns, to be placed in Fort Knox, opposite Bucksport. An enemy would not probably concern himself at all about Fort Knox and Bucksport if he could secure the ports and railroad termini Rockland and Belfast. These cities, and the Bay proper, are entirely abandoned by the Fortification Board's scheme. Does it not appear, that, in doing so, the Board has virtually abandoned the State, or at least compromised its safety?

BATH.

Bath is located on the right bank of the Kennebec River, twelve miles from its mouth. There is ample water from the ocean to the city for any ship. The current of the river is so strong that it is rarely obstructed by ice. There is a railroad running west to Brunswick, about five miles distant, where roads branch to the north and north-west, and one goes south to Portland, keeping near the shore-line of Casco Bay. *Sheepscot River* from the ocean to Wiscasset is within ten miles of Bath, therefore the closing of this river must be included in the defense of Bath;

there is, moreover, an interior passage from the ocean through Booth's Bay and Sheepscot River on, through, north of Georgetown Island and Arrowsic Island to the city. Wiscasset, besides, is a tempting object of attack itself; its harbor is, perhaps, the finest on our coast, and it would serve admirably as a base for a land attack on Bath. One emplacement on Southport Island, or on Georgetown Island will close Sheepscot River; one at the mouth of the Kennebec will close the river proper. Owing to the nearness of the land to the ship channels, the guns at these emplacements need not be of the largest caliber. The Fortification Board has recommended three 10-in. guns for the defense of the Kennebec, to be placed in Fort Popham at the mouth of the river. A 10-in. gun will not give an energy of 20,000 ft.-tons to its projectile at the muzzle. Since these waterways are deep enough to admit any ship of the world, it seems self-evident, in view of present armor strength, that heavier guns than 10-in. are needed here. Fort Popham, moreover, has no bearing on the interior passage to Bath, *via* Booth's Bay.

PORTLAND.

Portland is, perhaps, more in need of a strong defense than any point north of New York. Nature has given to it a deep harbor, free of ice the year through, and good anchorage in Casco Bay, behind Bangs' and Peak's islands. Man has added to this an ample railroad system that reaches out north into Maine, south into wealthy New England's center, west to the Connecticut valley, and, north-west, two excellent trunk lines are laid across the narrow space to the Canadian frontier; between Lake Champlain and the Green Mountains, within a distance of 80 miles, six railways cross the boundary and pass on to the Atlantic coast.

The great naval power of Great Britain, the many difficulties we have had with her, the clouds that are even now on the horizon, with the well-earned reputation she has of keeping an eye to her interests, and casting sentiment aside when her way seems clear,—all these, together with the crowning facts that Portland is practically the shipping-port in winter for the entire Dominion of Canada, and that this point, with the Maine coast to the north, is absolutely necessary to a vigorous growth of the Dominion, mark it out as the first objective of the British in case of hostilities. It may be counted on, that within a week after hostilities are declared, Portland will be exposed to a serious attack from

this most powerful naval power of the world; this attack from the sea would be supplemented by a dash by land from Canada. If it is to be taken, it must of course be quickly done, for, with a month's delay, we could likely prevent its capture, but we could not prevent its bombardment and the payment of a ransom.

The importance of the place, and its present and prospective wealth, warrant its receiving defense against shelling as well as capture. It is so situated within the salient of Cape Elizabeth, that it is exposed to shelling fire at four to five miles range off Portland Head, and from six to seven miles range from the vicinity of Richmond Island to the south; there is thus a front of about 110° of arc over which an effective fire must work in defending the place. It would appear that such a fire would be given by emplacements for first power guns on Jewell's Island, at Portland Head, and on Richmond Island to the south.

The Fortification Board recommends,

Twenty 12-in. guns.

Ten 10-in. guns.

Ten 8-in. guns.

Forty-eight 12-in. mortars.

Six torpedo boats,

and a complete system of submarine mines, for the defense of this port.

Confining attention to the largest guns of the outer line, which alone are dealt with in this paper, it is to be noted that the muzzle energy of 12-in. guns at present does not equal 25,000 foot-tons. At two miles range this energy will fall to about 15,500 foot-tons; the Schneider 18.9 in. plate in the Spezia trials of 1884 showed its decided superiority over a blow of such power as this. We must be prepared to overmatch at least a twenty-inch plate like this, at ranges of from four to six miles, if Portland is to be made safe from shelling.

PORTSMOUTH.

Portsmouth has a good harbor, with ample water for first-class ships of war. It is the location of one of the U. S. Navy Yards. It is on the main system of railroads north to Portland, northwest to Canada, and south to Boston. Its capture would seriously threaten Portland. Next to Portland, it is, possibly, the most tempting objective for a sudden dash that is held out to the British.

The ten-mile range circle from Portsmouth as a center, leaves the coast north at about Cape Neddick, passes just outside of Hog Island of the Isles of Shoals, and comes to the coast south at about Little Boar's Head. It is clear that if the enemy secure possession of the Isle of Shoals they can shell Portsmouth *ad libitum*; these isles must, therefore, be thoroughly fortified if Portsmouth is to be secured against bombardment. It is about 6.25 miles from Hog Island, the largest of the Isle of Shoals, across to the main land. It thus appears that emplacements for first-power guns on Gerrishe's Island, Hog Island, and at about Locke's Point south, would give reasonable security to Portsmouth.

The Fortification Board recommends four 12-in. guns for the outer defense of this city and harbor. The conditions are about the same as in the case of Portland, and, therefore, it is thought that these guns are too light for outside work. In case of war with England, the *Conqueror*, *Colossus*, *Edinburgh*, *Collingwood*, *Rodney*, *Benbow*, *Camperdown*, *Howe*, *Anson*, *Hero*, *Renown*, and *Sanspareil*, with their 18 inches of compound armor, and the *Nile* (constructing) and *Trafalgar*, with their 20 inches of armor, could stand five miles from shore, and within eight miles of the city, and, while shelling it, be beyond serious damage from 12-in. guns.

ROCKPORT AND GLOUCESTER.

These are the next deep harbors going down the coast. It is not considered likely that these cities will be subjected to a serious attack. No sufficient advantages are to be derived from such an attack, even if successful. The possession of Cape Ann by an enemy could yield him little benefit. The Cape is really a peninsula, and near West Parish the neck, across from tide-water to tide-water, is but a few hundred yards wide. An enemy landing could be easily "bottled up." It would be impossible to protect Rockport and Gloucester from shelling by shore batteries; it would seem that their defense, therefore, reduces to one of an interior nature, in which torpedoes and smaller guns will be used to prevent the landing of small bodies.

It is very much the same way with the country east of a line drawn from Boston to Providence; there are so many other portions of our country that hold out greater direct and indirect rewards that the section may, we take it, safely be left to an ample torpedo defense.

BOSTON.*

Boston is, then, the only point on the Massachusetts coats which will be considered as open to an attack of the first order. Its size, commercial importance, wealth, and re-entrant position on our coast line, combine to make it a place of great value to an enemy; it should receive our best efforts toward making it perfectly secure.

Nature has plainly marked out the defense in a most happy way. The city is situated at the apex of the re-entrant angle of which one side runs north-east to Marble Head Neck, and the other south-east to the neck of Nantasket Beach. Nahant projects bastion-like from the first side at about ten miles from the apex; in a similar way Nantasket Beach juts out from the south-east side, directly opposite Nahant. It is a little over seven miles from Point Allerton, the extreme point of Nantasket Beach, across to the south point of Nahant. The main ship channel goes into the harbor close along the Point Allerton shore, and passes on through between George's Island and Lovell's Island, and between Deer and Long Islands. Two other channels pass in through Broad Sound, between Deer and Long Islands. The cluster of Brewster islands lie on the line joining Point Allerton with Nahant, about $2\frac{1}{2}$ miles from the former and 5 miles from the latter. The ten-mile range circle from Boston's center passes from just beyond Nahant on the North, outside Outer Brewster Island, to Point Allerton on the South. If emplacements be located on the south point of Nahant, on Outer Brewster Island, and on Point Allerton, the ten-mile shelling limit will be thoroughly covered. Ships passing in between Nahant and Outer Brewster must meet a fire at $2\frac{1}{2}$ miles range from Nahant and Outer Brewster; between Point Allerton and Outer Brewster, a fire at $1\frac{1}{4}$ mile range.

Since all channels pass in between Deer Island and Long Island, and since, also, Deer Island has a bearing on all of Broad Sound, it would be well to locate a fourth first-power gun on Deer Island. Twenty-inch guns should, therefore, be placed on Nahant, Deer Island and Outer Brewster. Eighteen-inch guns would be large enough for Point Allerton.

The Fortification Board recommend eight 16-in. guns for the defense of Boston. It is doubtful whether these guns would

* See map at end of paper.

close the $2\frac{1}{2}$ miles between Outer Brewster and Point Allerton.* It is certain they would not be able to keep ships out of Broad Sound.

The city can be thoroughly defended from the shore, and when this is possible it is always far better to resort to land defense, with its fire from an emplacement without motion, than to depend on the more expensive, less accurate fire of floating defenses, which may disappear by destruction in the twinkling of an eye, at the very moment of greatest need, leaving the city naked before the enemy's fire.

NARRAGANSETT BAY.

After leaving Boston, going south, there is, as we have seen, no important point demanding attention until we arrive at Narragansett Bay.

This body of water runs far up into New England. Its entrance is almost opposite the entrance to Long Island Sound. It is a deep, well-sheltered body, has ample anchorage for any fleet, and its possession would be of greatest value to an enemy on this account. But it has, besides, a strategical value, from the fact it works its way so far up inland, that, from Providence, an army could threaten Boston to the north or the Connecticut Valley west, and the wealthy country between Boston and New Haven.

Its safety should be secured at all hazards. This is not difficult to do. But while it will be an easy matter to close the entrance, it will be a difficult matter to protect Newport from shelling.

It is true no harm beyond destruction of property and demoralization of the citizens would result from the bombardment of Newport; large commercial interests would not be interrupted as a result, nor would it in any measure tend to open up the entrance to the enemy. So little advantage would come to the enemy, it is doubtful whether he would be tempted to shell the city for the mere sake of shelling. If the problem be merely to close the entrance, emplacements on Beaver Tail Point, and Sachuest Point, would appear to be right locations. The passages on either side of Beaver Tail Point, and to the main land across from Sachuest Point are so narrow, that 16-in. guns would have sufficient power. If Newport is to be protected, the highest

* See arc of small circle described from Outer Brewster on map, indicating effective range of 16-in. gun against a 20-in. steel plate.

power guns will be needed, with an additional emplacement, say, at Coggeshall's Ledge.

The Fortification Board recommends two 16-inch guns, ten 12-inch guns, and ten 10-inch guns for this point. This will certainly secure the Bay, but will not protect the city.

THE EASTERN ENTRANCE TO LONG ISLAND SOUND.

This is the first point of the defense of New York in approaching from the east. If this entrance be made secure, New York will be guarded against all naval attack from the east, and this security will be shared by all Sound cities. There is no point on our entire coast the fortification of which will protect so great an amount of property. No pains or expense should be spared to make the entrance absolutely impassable to any fleet. It is quite a striking fact that nature has placed the three islands, Plum, Great Gull, and Fisher's in a line between the extreme northern point of Long Island, called Oyster Pond Point, and the neck of main land projecting South from Rhode Island, called Napatree Point. These islands make it possible to provide as strong a defense of this entrance as may be necessary from shore batteries alone. It is about 18 miles across from Oyster Pond Point to Napatree Point, but over 9 miles of this distance is taken up by the three islands named. A good channel lies between Plum Island and Long Island, known as Plum Gut. It has abundant water for any draught of ship; it is about a mile and a quarter wide, but the available channel is only about five-eighths of a mile wide. The velocity of the tidal current through the Gut is very great.

It is about two and a quarter miles from Plum Island to Great Gull Island. The channel between Plum Island and Gull Island is not good, only four fathoms of water at mean low water at the deepest point, which is along a line close to Gull Island. The space between Gull Island and Fisher's Island is called The Race; it is about four miles wide. The tidal current here is very swift, running from four to six miles per hour. The water is very deep and will carry any ship. Valiant Rock projects above the water at about the middle of The Race, dividing the channel into two distinct parts. The space between the north point of Fisher's Island and Napatree Point is not navigable to large ships, and the channel is so tortuous that if the buoys were removed, strangers could not use it; a few mines would close it effectually.

It would appear that guns placed on Plum Island, Gull Island, and at or near Mount Prospect, Fisher's Island, would give a vigorous defense.

The Fortification Board refers only incidently to the defense of this line. It does not include its defense in its list of points arranged for defense in "order of urgency." New London, the nearest point, it places No. 15 on the "urgency list," to this point the Board assigns four 12-inch and four 10-inch guns.

NEW YORK.

If the entrance to the Sound be made impassable, there is no need of defending New York from naval attack at Throgg's Neck. The fort at Willett's Point and Fort Schuyler, opposite, if not useless, would have their importance reduced, becoming an interior defense of secondary importance, and it is thought the Neck could be amply secured by submarine mines, with some assistance from relatively small caliber guns on the shore.

We may, then, confine attention to the entrance from the south through Lower New York Bay and The Narrows.

The mouth of the Lower Bay, from Sandy Hook across to Coney Island, is a little over seven miles wide. If powerful batteries of 20-in. guns be placed at the two points named no modern vessel could pass into the Bay without exposure to thoroughly effective fire at a range of about 3 to 3½ miles. Another emplacement on Staten Island shore, near Elm Tree Beacon Light, would thoroughly control the Lower Bay, and this body of water would be swept by the fire from Sandy Hook and Coney Island also.

There are three channels leading into the Bay from the ocean, *vis.*: *East Channel*, between East Bank and Dry Roemer Bank; *Swash Channel*, between Dry Roemer and East Knolls banks; *Main Channel*, which sweeps by Sandy Hook around East Knolls on the south and west sides.

The Sandy Hook battery would have a close, almost point-blank fire, on the entrance to Swash and the Main channels. East Channel would be under the fire of both Coney Island and Sandy Hook batteries. The Staten Island battery would have a cross-fire bearing on all three channels.

There is another point that demands attention. South of Coney Island, about one mile and a half from shore, there is a pocket of five-fathom water, east of East Bank, to which deep water runs from the ocean. If this be occupied by the enemy, he

could shell Brooklyn at about 9 miles range, and, if his guns have a range of over ten miles, he could drop shells into New York's business section. The ten-mile range circle from Brooklyn, passing just beyond this pocket of deep water, comes to the shore on the east just beyond the point of Rockaway Beach. Rockaway Inlet and Jamaica Bay are thus water areas from which powerful guns might shell Brooklyn from light-draught boats.

A second battery on Coney Island, directly south of Gravesend, would control all these points effectively, and at the same time have a bearing on East Channel.

Four emplacements, therefore, at the points indicated, would be able to bring an effective fire on every part of the Lower Bay and the approaches thereto from which Brooklyn or New York could be shelled by an enemy.

It is perfectly clear that it is impossible to defend these cities with 16-in. guns, that is, from the shore; and we have seen that a resort to floating defense is less accurate and is in constant danger of being sent to the bottom by the enemy at the critical moment, in which case there would be no defense. The advantages of a motionless, non-sinkable emplacement, and the independence of weight and dimensions of armor and guns enjoyed by *shore defense*, can not too often be called to mind, and insisted upon wherever the defense of a place is possible from the shore.

The artillery in time of war will be held responsible for the defense of the cities of our coast-line. If, from any cause, our fire is unable to give a safe defense, the indignation of the community will be sure to work itself out in the undeserved punishment of the hapless artillerist. At such times, the argument that we have had no voice in the designing, making, or acceptance of the weapons we use, will not be of any value. It will then serve no purpose to point out to the people how their legislators have neglected the needs of their *real* defenders, as to *matériel*, and organization of *personnel*. By a combination of influences the Artillery as an organization is now kept in strict official silence when matters of armament or coast defense are determined.

It is quite likely that the present Congress will do something in the way of making appropriations for armament of the coast. In this first venture, after years of waiting, it is important that no mistake be made. We appear to be on the point of spending

millions of money on 8-inch, 10-inch, and 12-inch rifles. These guns are only suited for interior defense of harbors and channels. They are completely useless in the defense of cities from shelling, and all other outside work. Their construction is to be proceeded with at a new Government Gun Factory, with a view to developing home gun-making. Step by step, the Ordnance Department is to feel its way up through the mechanical difficulties of building up guns from the present largest caliber, 8-inch, to 10-inch, to 12-inch, to 16-inch guns; this last being the end of present intention. The experimental mechanical efforts connected with producing a *standard type* for each caliber, will certainly require much time, apart from that necessary for the manufacture of the requisite numbers of each caliber. It will be years before we shall have crept up to that degree of mechanical skill that will enable us to establish and prove a standard 16-inch gun on the present built-up design. In the meantime something new may turn up in gun design, and our years of work will have to be repeated with the new system. All this time our sea-coast cities will be exposed to bombardment. When a 16-in. gun is finally arrived at, it will not protect our cities from first-class guns on first-class ships.

Taxes paid for armament are to be regarded, in a measure, as insurance premiums paid for insurance of life and property against loss of both, or either, from unusual causes. If it be possible to mount on our coasts guns that will protect our cities from the demoralization, destruction of life and property, and paralysis of business that will come to them from shelling of guns now afloat, within a fortnight after declaration of hostilities against us by almost any power, these guns ought to be secured with the utmost despatch from whatever source they may be obtainable.

The conclusion is reached, that we ought to *purchase finished guns directly, and at once*, of a caliber large enough to give ample energy to our projectiles to make our cities safe from shelling. It would be a happy fact if money would be granted by Congress at the same time to establish the Watervliet Gun Factory, and to proceed with the making of small caliber guns under the plan of developing home gun-making, but, if Congress will consent to but one plan at a time, it seems logical to first secure protection by the *speediest* means possible, then, afterwards, experiment.*

* I do not mean to imply that the built-up gun is an "experimental" gun. I refer to the mechanical difficulties, that must be met, anew, with each increase of caliber in making guns on the built-up design.

It is advocated, therefore, that contracts be opened to the world for supplying guns of the largest caliber, regardless of design, providing only in the terms of the contracts that a reasonable proof-test shall be passed, and that a proper standard of ballistic power shall be attained.

In this matter of armament, the interests of citizens and of the artillery branch of the Service are the same. The people have stood without protection for years, as we of the Artillery have stood without proper weapons; it is believed that the need of guns on our exterior lines that will protect in time of sudden war the lives, property, and business interests of our citizens, and the military honor of their defenders, is so urgent, as to entitle it to precedence over any present pending military question.



NOTE. This map is drawn accurately to scale from the latest Coast Survey chart. Numbers in parenthesis indicate depth of water in fathoms; water is deeper E. of these points.

Boston Harbor.

PRACTICAL INSTRUCTION OF OFFICERS AT POSTS.

BY LIEUT. JOHN P. WISSER, U. S. A.,

FIRST ARTILLERY.

THERE is often a feeling prevalent, not only in the Army but in all branches of Science and even of Art, that *students* are not *practical* men. Without stopping to argue this point I will content myself with two quotations, one relating to the study of Art the other to the study of War.

The first is:

"The phenomenal results produced by the French School of Fine Arts, which for nearly four and a half centuries has successfully trained men from every civilized country of the earth, is a constant refutation of the criticism of those who insist that to bring a student in contact with the masters of his art is merely to develop imitative ability through a system of instruction tending to perpetuate mannerisms, cramp individuality, and fetter genius—rather than to stimulate genuine originality."*

The other is by Sir C. Napier:

"Young men, joining their regiments, have all the temptations in the world to pleasure, none to study; and they some day find themselves compromised on service from want of knowledge, not of talent."†

Nearly all the great military men which the world has produced were students. Nevertheless, it is true that only those men who have the best opportunities of applying practically what they have studied theoretically are apt to be the leading men in their professions; but it is also true that if those men, who have acquired their reputation by purely practical means, also had a

* Henry O. Avery. Scribner's Magazine, October, 1887.

† Sir C. Napier. Quoted on title page of Clery's Minor Tactics.

thorough theoretical knowledge of the subject, they would have been stronger men.

Our Military Academy teaches the necessary theoretical subjects and such practical work as there is time for. Our Schools of Application at Willet's Point, Fort Monroe and Fort Leavenworth have accomplished much good in the way of practical instruction, but there is still too much time devoted to theory and too little to practice at the two last-mentioned. Instead of devoting all the time now given to the Art of War, to the study of campaigns, and military history, the course should strike lower and teach practically, as well as theoretically, the every-day duties of a subaltern officer in the field; instead of teaching the construction of military bridges by laborious drawings in the section-room, would it not be better to actually construct bridges until each officer is perfectly capable of constructing at least one good military bridge practically? The tendency at both these schools has been to constantly improve the practical course, and often the practical work must be dispensed with for want of proper facilities.

But at the posts of the Army, where there is plenty of time and opportunity, where one would expect to find the practical work of preparing for war going on at all times, we find very little besides drill and target practice.

The armies of Europe are continually ready for war, and Germany, France, Austria and Russia have all had wars later than our own, does it not seem proper for us, therefore, to go to them and learn what means they have found good in order to keep their armies, and especially their officers, prepared for war at any instant?

The most important practical work that an officer is required to perform in field service is the application of the principles of minor Tactics, and these, in our army, have been taught only theoretically thus far, although some few steps have recently been taken at the two schools of application of the line to teach them practically. This practical teaching of this most important of military subjects is what I desire to call especial attention to; it is the characteristic element in the modern system of military instruction, and it is a subject which is almost totally neglected at our military posts where it could easily be taught, and not only be of great benefit as a matter of knowledge, but also add greatly to the interest of garrison life, furnishing those who have seen

active service an opportunity of imparting their knowledge and experience to others, and the latter an opportunity of acquiring practical knowledge not otherwise attainable. Of what use, for instance, has the experience of our older officers during the Civil War been to the younger generation? With a proper system of practical instruction in Minor Tactics, not only would many of the principles and lessons there acquired have been transmitted to the young officers, but the older ones would have firmly fixed these principles in their own minds by constant reference or repetition, and both would have been benefited. Indeed, so it is in Europe to-day, the officers who have seen service are the instructors of those who have not, and thus no experience is lost.

The fact that the Cavalry or Infantry on the Plains have been much scattered is some excuse for the neglect of this subject, but as the tendency now is to concentrate them in large posts this no longer holds. The Artillery sorely needs a new organization, not only to give it life and interest, but also to bring it back to its legitimate work and duties.

To show that I am not exaggerating the importance of the subject under consideration, I will here present a few observations made by a civilian on the state of affairs at army posts:

"Of course, the existence of the extraordinary region of the Upper Yellowstone was known to a few; but there was very little accurate or certain knowledge of it. Indeed, the policy that the Government still pursues in regard to this great Alpine region seems curiously stupid. At various points, commanding natural western highways, are stationed small military posts; but the officers and men condemned to live in them, from year's end to year's end, are not only not encouraged to make themselves acquainted with the intricacies of the vast mountain regions lying near them, but are so hampered by a cheese-paring policy that even a hunting-trip of a few weeks is almost an impossibility.

"Now, an Indian outbreak may not be likely to occur in the future, but it is still far from impossible that it should occur. * * * Such an outbreak would be followed by terrible loss of life, * * * and to dislodge them from perhaps the most difficult natural fortress imaginable, with United States Infantry, only accustomed to barrack-square tactics, and such cavalry as might be attainable, would be a costly task.

"No smarter officers, no keener sportsmen, are to be found anywhere than can be found at our frontier posts, but, look long-

ingly as they may toward the blue line on the horizon, transport is denied them; they are not, as a rule, men of large private means, and cannot afford to invest in transport for themselves, and so, if I may be pardoned the hackneyed quotation - metaphorically

' Their limbs are bow'd, though not with toil,
But rusted with a vile repose.' "

Before proceeding to outline a system of instruction for our own posts, I will give a brief account of this instruction in Austria.

The system of instruction in the Austrian army is quite complete in spite of the complexity caused by the large number of peoples, differing in language and customs, in the Empire.

The classes of schools of application, properly so-called, are four in number :

The Army School of Musketry,
The Cavalry Brigade Schools,
The Artillery School of Equitation,
The Artillery School of Gunnery.

Besides these purely practical courses, there are also schools for *promotion*, at which officers prepare for their examinations for promotion, and the *higher* schools, including the Higher Artillery Course, the Higher Engineer Course and the War School.

But, aside from all these, there is at every post in the army a theoretical and practical course for all the officers, and this course constitutes the subject of the present essay. -

The objects of this course are to insure a thorough knowledge of the duties of officers, to secure a uniform method of execution of prescribed tactical formations and movements, to enlighten the mind in regard to decisions on military points, to develop the faculties and to furnish the necessary skill and practice in conducting the several Arms of the Service in time of peace and in the field.

The subjects of the course differ somewhat in the different Arms of the Service, each giving special attention to those relating to its particular and most important duties. The courses of the Pioneers, Train and Sanitary troops are also given, for, since we have no special troops of this kind, their duties should be taught in one or other of the arms we have.

COURSE OF INSTRUCTION IN AUSTRIA.*

The course of instruction includes the following important subjects:

Lectures and Discussions.	Target Practice.
Solution of Tactical or Technical Problems.	Riding.
Kriegsspiel.	Logistics.
Journeys of Instruction.	Administrative Duty.
Fencing.	Rides of Practice.
Special Details.	Description of Streams.

Most of these subjects are common to all arms, but several are limited to one or more.

Drill tactics, or what we call *Tactics*, are not mentioned, as every officer is expected to be thoroughly conversant with this subject, and for this knowledge the commandants of battalions are held responsible.

LECTURES AND DISCUSSIONS.—The lectures and discussions take place once a week, between the first of December and the end of March, and never last more than an hour and a half. All the officers of the garrison are usually assembled for these lectures by the post commander. Commanding officers deliver most of the lectures themselves, but they may also detail the battalion commanders, officers aspiring to the rank of field officers or others to lecture on special subjects. The programme is arranged in November, so that the officers required to deliver lectures may have time to prepare themselves.

The subjects of the lectures include scientific subjects, especially the minor tactics of the several arms, including all recent improvements and changes; the organization and general tactics of the army; target practice; service duties and laws relating to discipline. In the field artillery special attention is given to the minor tactics of that arm, in fortification artillery to the attack and defense of fortifications, and in both to the science of gunnery, including the use of artillery in the field and in fortifications, the equipment and command of the artillery reserves, together with a general outline of the organization, equipment and minor tactics of foreign artilleries. In the Pioneers the subjects include military and technical subjects, especially those relating to field technology, recent progress in pioneer and pontonnier work, military

* Condensed from my report on the Military Schools of Europe to the commanding officer of the U. S. Artillery School.

bridges and the construction and destruction of railroads. In the Train the lectures relate more particularly to train duty in time of war, recent progress in the Art of War, logistics, harness, the theory of wagon construction, new discoveries and comparisons of the trains of different nations.

The subjects of the discussions are the subject-matter of the lectures and the practical problems in minor tactics. In the Pioneers and Train the discussions relate to the larger and more important constructions and the papers of officers on technical subjects.

The drill-tactics form no part, either of the lectures or the discussions, except in so far as they find application in minor tactics.

A record of the essays read is kept in a journal, which is preserved as part of the post records.

THE SOLUTION OF PRACTICAL PROBLEMS. — The practical problems here referred to pertain to the subject of Minor Tactics, but in the Engineers, Pioneers, and Train are also included problems relating to the more important field-work of these branches of the Army.

The general character of these problems, explained and illustrated in my previous paper,* but a brief outline will not be out of place here. A general description of the character of this work will first be given, and then the various modifications in the different arms of the Service will be briefly alluded to. The object of this work is to sharpen the intellect in grasping military situations, to assist the officers in coming rapidly to decisions on tactical (not *drill*) questions, and to express orders clearly and explicitly.

These problems are solved either in the lecture-room, with the assistance of general maps and charts, or in the open, on the ground itself, with the assistance of special maps more detailed in character and on a larger scale. The problems solved in the lecture-room relate to the concentration of troops for the battle; those solved in the open, relate to the battle itself.

All the officers and cadets of the post take part in this work. The problems are dictated to the captains by the regimental commanders, to the subalterns and cadets by the battalion commanders. The officers are assembled in the lecture-hall, the

* JOUR. MIL. SERV. INST., June, 1887. Also, "Practical Problems in Minor Tactics and Strategy." Ft. Monroe, 1886.

problem is dictated and solved at once. The officers are previously informed only of the part of Field Duty or Minor Tactics, to which the problem will have reference. Two problems are solved in the lecture-hall between December 1, and March 31.

The *subject-matter* of the problems in general includes all duties that may arise in actual War, except such as are involved in ordinary drill.

The *situation* is the relation of the command specially concerned to our own and the enemy's main body of the troops. Only so much of the enemy's position is given as is liable to be known in actual War.

The *problem* proper is always given in the form of an order.

The *solution* contains :

1. The military estimation of the terrain.
2. The leading thought in the execution.
3. The orders to be issued.
4. The drawings of the situation of the troops concerned at particular moments.

The military estimation of the terrain is not a simple description, but considers the ground with reference to the particular problem to be solved. The leading thought is a clear statement of what is to be done and how it is to be done. The orders to be issued should state first the general situation, mention the general object to be attained and the general method of execution proposed, then give the special directions to the separate commanders. The object of drawing separate situations at various moments during the movement is to instruct in the relations of time and space; these drawings are generally made on tracing-paper, a few points being taken from the map, and the positions of the troops are then sketched in with the common conventional signs.

The tactical problems in the open are solved between April 1, and June 30, two each year. They resemble the problems given in the lecture-hall, but are more detailed, and usually include the actual execution with troops. A written report is afterwards submitted by each officer present. A great deal of this kind of work, not here included, which is simpler in character and involves the rudiments of this branch of the Art of War, is executed during the so-called daily Field Duty, of which the German officers, especially the cavalry, have about eight hours a day.

After these problems have been solved, they are *criticised* by the officers dictating them, and are afterwards *discussed* at the

officers' meetings. The problems, after solution and discussion, may be executed practically with troops.

These problems should be simple and capable of solution in two or three hours at most, usually in from one to two hours. At first, known country, as, for instance, that in the vicinity of the garrison is selected; later the officers are taken farther out, to country comparatively unknown to them. The strength and character of the troops must correspond to the character of the duty to be performed and to the military geography of the country. Troops of one Arm of the Service only are used at first, then gradually mixed commands of greater and greater complexity. Usually, too, the problems are selected so as to form a consecutive series, illustrating the passage from the state of rest to that of movement, and from movement to battle.

This general outline applies to all the Arms of the Service, but there are several points in which the different arms differ from each other, the most important being the subject-matter of the problems.

INFANTRY.

The subject-matter of the problems for the lecture-hall in the Infantry includes out-post duty, advance guards, the duties of flankers, the formation of troops for battle, the opening of the battle and the grouping of the troops, reconnoissance, levying requisitions, the conduct of trains and transports.

The problems in the open relate to the determination of the proper moment for passing from the order of march to the order in line of battle and the mode of execution of the movement, the formation and growth of the firing-line, movements in advance within range of the enemy's fire or the dispositions of the other side for resisting the attack, preparations for supporting, increasing the density of and extending the firing-line, the determination of the time for placing the main body of troops and the reserve on the firing-line, and the supply of ammunition.

CAVALRY.

The subject-matter of the written problems for the Cavalry is taken from the practical field duty actually required in time of war, and the cases selected are those most liable to arise in war. It includes dispositions for insuring the safety of the troops and for obtaining information, the duties of advance guards, rear guards and flankers, patrol duty, and out-posts and the battle,

including the passage to the battle formations, the opening of the combat and the grouping of the forces, with special reference to the duties of the Cavalry. In addition, the conduct of foraging parties, levying requisitions and convoys.

The field problems of the Cavalry relate to the precautions for insuring the security of the troops, the arrangements for the prompt delivery of reports, establishing communication, arrangements and formations during halts and during advance movements, different gaits under various conditions, attack, fighting on foot and breaking off the combat.

ARTILLERY.

In the Field Artillery, the written problems include reconnoissance duty, marches, taking up a secured position during a halt, establishing outposts and the various phases of the battle, including the passage to the battle formations, the opening of the battle and the grouping of the forces.

In the Fortification Artillery are included the arrangements for placing a fortified place in a state of defense, the equipment and transportation of an artillery siege train, establishing the same in front of the place to be attacked, construction of batteries of attack, execution of the artillery combat by the attacking or the defensive artillery, and the repair of damages to the epaulements.

The field problems for the Artillery include positions for guns, coming into battery, determination of the firing lines, the selection of the target and the determination of its distance, positions of pieces and caissons, change of position and obtaining cover for the guns.

ENGINEERS.

The practical problems of the Engineers may be divided into:

- Tactical Problems.
- Technical Problems.
- Tactical-Technical Exercises.
- Applicatory Exercises in the Attack and Defense of Fortifications.

Tactical Problems.—The tactical problems are similar to those already described. Between December 1 and February 28 the officers solve one tactical problem. The subject-matter includes advance guards and rear guards, establishing outposts, and the battle, especially the formation of the line of battle, the open-

ing of the battle, the concentration of the forces, and the attack and defense of the villages and fortified positions.

Technical Problems.—The technical problems relate more particularly to the specific duties of the Engineers. The subject-matter includes the destruction of obstacles and objects in general, the construction of temporary bridges, the fortification of camps, placing houses and villages in a state of defense, the attack and defense of fortifications, the construction of firing trenches and epaulements, and the destruction and repair of bridges, viaducts, houses, roads and railroads. In the solution the officer is allowed to use such hand-books as he is liable to have with him in the field. In other respects these problems resemble the tactical problems. The subalterns are required to solve one technical problem between December 1 and February 28.

Tactical-Technical Exercises.—On account of the great importance of these exercises, and the fact that not only Engineer officers, but also Artillery officers and officers of the General Staff, take part in them, we will consider these somewhat in detail. The object of these exercises is to instruct the officers in the proper disposition to be made of, and the orders to be given to the different detachments in the execution of tactical-technical field-work.

These exercises always form part of a larger problem. The subject-matter includes fortifications, rendering places more easily defensible, constructing communications, demolishing objects, removing obstacles, constructing cover for guns under the enemy's fire, etc. In most cases the main question is the proper subdivision of the forces and the assignment of the subdivision to their particular duties.

Each battalion of Engineers is required to solve yearly two exercises, called respectively I. and II. The exercise is conducted by an officer detailed as director.

I. The former of the two exercises all the company officers and cadets are required to take part in. Only such men are taken as are required to fill the posts required in each platoon and to furnish the necessary orderlies. The exercise relates to the use of technical troops in the immediate vicinity of the enemy, in rencontres and in attacks, including both the preparatory stage and the final attack. It is subdivided into two parts, I *a* and I *b*, the former involving one separate stage and its sphere being without the battle zone, the latter forming part of the battle zone.

a.—In this exercise an officer of the General Staff and an officer of Artillery for each supposed Division are detailed to act respectively as Chief of the General Staff and Battery Division (Half Regiment) Commander. The Engineer battalion commander acts as assistant to the director of the exercise.

EXAMPLE.

Subject-matter.—The rapid fortification of the position which the troops of the —th Army Corps occupy in the siege of the fortified camp A, on the evening of the —th, after driving back the enemy

Basis for the Solution.—An order from the Corps Commander on the —th, at — o'clock, P. M., with tracing on map giving the position of the troops and depots at the hour the order is received.

From these data are determined:

By the *Chief of the General Staff*: The dispositions of the Division commander for the establishment of outposts, for technical fortifications and for the defense of the positions; also the order to the commander of the Engineer company as to the duties of his company.

By the *Battery Division Commander*: A plan for placing and using the artillery in the case assumed.

By the *Commander of the Engineer Company*: The disposition of the working parties and the orders to the subordinate officers; reports, dispositions and necessities arising during the progress of the work; an outline tracing of the work done, with legend and sketches; and the report announcing the completion of the work.

On the day fixed for the solution of the exercise those taking part are assembled at the rendezvous and informed of the *ordre de bataille* and the supposition and dispositions of the Corps commander. The officers act accordingly, dividing into the proper groups, each limited to a particular sphere of action, reconnoitring the ground only so far as would be possible in actual war. The officer acting as Chief of General Staff develops the grouping of the forces and the use of the technical troops, while the Battery Division Commander and the Engineer Company Commander state their views verbally. The Chief of the General Staff then formulates the orders of the Division Commander relative to the Engineer Company and imparts the result to the Engineer Company Commander; later he writes out the orders resulting from the problem. The Engineer Company Commander makes his dispositions and gives his subalterns the necessary orders, which they proceed to execute.

b.—In this exercise the ground is usually first reconnoitred for the information of the director of the exercise in order to facilitate the selection of the sections of ground for the various “moments” in the battle; and, since the sections are liable to be far distant from each other and the “moments” often days apart, the problem is not executed in actual time, but the suppositions in regard to the successive events are modified so as to enable the officers to execute several on one day and at one place.

EXAMPLE.

Subject-matter.—The commander of an Army Corps, advancing as the outer right echelon of an army, receives from the Army Headquarters the information that the enemy is concentrating at x, thus necessitating a change of front of the army.

He is ordered to execute the change of direction on x and to secure and maintain contact with the enemy; in case of collision the corps will defend itself, and as soon as the next corps arrives within supporting distance the offensive will be resumed.

During the execution of this movement reports come in from the advanced cavalry that at N and M are strong subdivisions of the enemy.

On the strength of these reports the advance is stopped. It is 4 P.M. He assigns positions to the divisions and orders them to place themselves in a state of defense for a possible attack in the morning. The troops encamp in rear of the line of defense.

Basis for the Solution.—The order of the Corps Commander and a tracing of the position of the troops at the time this order is received by the divisions.

The determinations from these data are similar to those under *a*.

On the day fixed for the exercise the director and those taking part are assembled on the first section. The director gives the supposition and *ordre de bataille*, dictates the data necessary for a clear idea of the situation and develops his tactical view as to what is to follow. The officers put their respective views on paper in a given time. The director then gives his view as a result, and if it involves the use of technical troops he has his Chief of the General Staff formulate the necessary orders. The order for the Engineer Companies is dictated to those acting as Engineer Company Commanders of the Division, who work out the dispositions and orders required in a given time.

The other moments of the battle are similarly considered.

II. On account of the distance of the field from the garrison this class of exercises is attended, as a rule, only by the field officers and the captains aspiring to the rank of field officer. These exercises relate to the use of technical troops in cases where the conclusions involved have been reached by the Corps Commander a sufficiently long time in advance to allow of a reconnoissance of the country and the selection of a plan for the necessary works.

An officer of the General Staff is detailed as Chief of the General Staff of the Corps, a field officer of artillery as Chief of Artillery and an Engineer Officer as Chief of Engineers.

EXAMPLE.

Subject-matter.—A part of the army is to await the arrival of another part, before beginning the general offensive movement, in a position covering a strategically important point.

On the supposition that a strong enemy may anticipate the arrival of the reinforcements by an attack, the position is to be strengthened by drawing in the army intrenching material park from *x* with previously arranged technical forces.

Basis for the Solution.—An order from the Army Commander, including not only the general dispositions, but specifying also where the separate train columns strike their respective Corps, (in order that the location of these reserve depots, on the day preceding that on which they will be required, may be determined), and including also a tracing (with map) of the position of the corps at the time of arrival of the order.

From these data are determined:

By the acting *Chief of General Staff*: Before the beginning of the exercise:

The orders relative to the preliminary disposition of the technical troops, working parties and intrenching material columns; their temporary assignment to the Chief of Engineers of the Corps; the measures for a reconnoissance and the selection of the plan of fortification; the turning over of the execution of the work to the Chief of Engineers.

During the exercise:

The report of the Chief of General Staff to the Corps Commander on the reconnoissance and plan of fortification; the orders of the Corps Commander relative to the encampment of the troops and the defense of the position, including the grouping of the units, the establishment of outposts, the limits of the defensive line for each division in case of attack, and the notification of the works to be constructed within these limits; finally, the orders for the Pioneer Company, unless under the orders of the Engineer Chief.

By the *Chief of the Corps Artillery*: The plan for the use of the Artillery in general and the Corps Artillery in particular.

By the *Chief of Engineers* of the Corps: The plan for the work to be executed; tracing, with legend, of the works as decided upon by commission; the dispositions, orders for the execution of the work, and such measures as may be found necessary during the progress of the work; the report to the Corps Commander on the completion of the work and the orders to the subordinates relative to their return to their normal duties.

By the *Engineer Company Commandant* : As in I., omitting the plan.

The work is carried out under the direction of the actual Chief of Engineers of the Corps. The engineer and pioneer companies, bridge-trains, entrenchment columns, working parties and so forth, under the protection of advanced troops, arrive at the ground a day or two ahead of the main columns so that the works may be completed soon after the arrival of the latter.

For each supposed Army Corps there are the officers detailed as Chiefs of General Staff, Artillery and Engineers, and the officers and cadets of the battalion.

The officers are assembled at the rendezvous, the director dictates, with the assistance of a map, the supposition, and the three chiefs make what reconnoissances are required. The subalterns and cadets are directed to the points where their companies would be. The three chiefs are accompanied in their reconnoissance by the director. As soon as this work is completed the Chief of General Staff makes his report and submits his plan, and the Chief of Engineers submits a plan of proposed work, with tracing and legend. The Director then gives his view as Corps Commander, and orders the necessary modifications.

The Chief of Engineers now issues his orders to the Engineer Company Commanders, who act accordingly. The officers keep each a record of the problem, marking orders given verbally as "verbal," and preparing all written documents as in active service. The subaltern officers prepare a paper containing the leading thought in their particular part of the work; sketches and tracings necessary to explain the work; calculations, propositions, etc.; subdivision of the detachment into working parties, and their equipment and posting; subdivision of the time; reports, requests; etc.; and finally, a short report on the completion of the work.

These papers of the subalterns are handed on the day of the exercise to the company commanders, who revise them and forward them next day, with their own reports, to the battalion commander, who adds his remarks. The reports of Chief of General Staff and Artillery are also forwarded to the battalion commander, and the whole is then arranged and consolidated into a general report, and forwarded within a week to Regimental Headquarters, where it is again revised and forwarded within two weeks to the Division Commander, by whom it is forwarded to the Inspector General of Engineers, who hands it to the War

Department, where it is recorded by the proper bureaux, and during the winter it is discussed by the officers.

The remarks refer to the appropriateness of the measures taken and to the fact of compliance or non-compliance with the prescribed forms in the execution of the work.

Applicatory Exercises in the Attack and Defense of Fortifications. The object of these exercises is to make officers familiar with their duties in the attack and defense of fortifications.

The exercises are divided into :

Elementary Problems for Engineer Officers only, and
Siege Operations, in which all arms take part.

The elementary problems include such details as cannot be carried out in the ordinary practical exercises, including, for the *attack*,—the tracing of the parallels, the organization and arrangement of the working parties, directions for the establishment of outposts, guards for the parallels and special reserves, the crowning of the glacis, directions for crossing the ditch, establishment of communication, etc; for the *defense*,—arrangement of the scarp, preparations for defense, cover, supply of ammunition and food, optical and electrical telegraph lines, counter approaches, etc. Whenever possible actual fortifications are taken as the sites for the solution of these problems.

The siege operations are divided into the larger and the smaller operations. The smaller siege operations are usually combined with mining operations, the larger take place only when specially ordered by the War Department.

PIONEERS.

The practical problems for the Pioneers may be divided into :

Tactical Problems,
Technical Problems and
Technical-Tactical Problems.

Tactical Problems.—These are similar to those already described for the line in general.

Technical Problems.—All the officers and cadets are required to take part in this work. The problems are prepared by the company commanders, arranged according to the special knowledge of each student, and, after approval by the battalion commander, are forwarded to the respective officers for solution, two such problems being solved between December 1 and March 31. In order to give time for the necessary preliminary work; such as

reconnaissance, leveling, etc., the problems are given out before the middle of September.

The subject-matter is taken from the work required in actual field-service, and includes road-building, constructions in water, railroads, bridges, field fortifications, ponton bridges.

Each problem is based on a supposition as to the position of the troops and the state of affairs generally, and in the solution the special points to be brought out are indicated. The supposition contains also a description of the condition of those objects which are to be repaired, and sketches of those to be constructed, and a statement as to the time, men, material and implements on hand, as well as the relative position of the troops. The problem is given in the form of an order.

The solution is subdivided as follows:

- General description of the ground,
- The leading thought or plan,
- The dispositions made,
- The representation of the work done by means of drawings.

Tactical-Technical Problems.—At the end of the practical exercise each year, a tactical-technical problem is solved by the combined officers and cadets of each battalion, on the supposition that the battalion is called upon to prepare bridges for an army corps, build a bridge-head, or prepare a battle-field for defense.

The problems are prepared by the battalion commanders and given out only in the field. In most respects they resemble the technical problems, but in addition they include the outlines of the technical works required and the subdivision of the troops into working parties.

On the day of the solution the battalion commander informs the subdivision commanders of the problem, and assigns to each his particular work, with further directions, which are copied into the note-books. The subdivision commanders then proceed to the execution of the work, *viz*: the subdivision into parties, the distribution of time, labor, material and implements, just as in actual Service, and finally make their report on the completion of the work. All details must be written as they would be in the actual work.

All these problems are criticised, forwarded through the proper channels, returned to the officer, and afterwards discussed at meetings.

TRAIN.

The subject-matter of the written problems for the Train includes plans for the equipment and mobilization of a Division or Brigade: plan for the order of march of the large train of an Infantry Division, or the train of an Army Corps in advance and retreat; plan for the rotation of men and material in a line of supply for a body of troops between the termini of the line; plan for the subdivision of the time required for the mobilization of a train squadron, having given the time of arrival of officers and men, the place and time of arrival of horses and the arrival of the means of transportation; brief outline of the duties of the commandant of a train-reserve establishment, of a cadre for a field-supply depot, or of a depot for sick horses, from the beginning of the mobilization to a definite time.

The problems in the field involve the duties pertaining to the assembly of the parts of a train column from their separate camps: the movement of a train column from a general park; the passage of bad roads and defiles; measures during long and short rests; the separation of parts of the train from the main column during the march; the dispositions for supplies; bivouac and cantonment; requisition of wagons, horses and pack-animals; the measures for the security of the train troops when alone on the march; and the conduct of the train in an attack or surprise.

From six to eight hours are allowed for the solution of these problems in the field.

SANITARY TROOPS.

The problems solved by the sanitary troops are similar to those already described, but refer more particularly to the special duties of sanitary troops in Peace and War.

KRIEGSSPIEL.—The problems solved by means of the Kriegsspiel are similar to the tactical problems. The instruction is directed by the regimental commanders, the practice taking place once a week between December 1, and March 31, and is specially intended to instruct the younger officers.

JOURNEYS OF INSTRUCTION.—In each Military Territorial District one or two half-regiments take part yearly in journeys of instruction, extending over a period of eight days, under the direction of officers of the General Staff, the object being to solve tactical problems in the field, to instruct the officers in various kinds of ground, and to make them more familiar with the surrounding country.

The captains who have not attended the War School or the Field Officer's Course, are the first for detail, and the number is proportioned among the several arms as follows :

Infantry.....	5 to 8
Cavalry.....	2 to 3
Artillery.....	1 to 3
Engineer or Pioneers	1

Several non-commissioned officers of cavalry are attached for *gendarme* duty. The journey from the garrison to the first day's position, and that from the last day's position back to the garrison, are regarded as travel under orders. During the exercises the officers receive each \$1.20 extra pay per day, the non-commissioned officers each eight cents, and the privates (officers' servants and grooms), each two cents.

During the journeys of instruction, tactical problems are solved—including two or three battles, dispositions for the march and the taking up of positions on the route—all of which are discussed and completed on the spot. The general situation assumed is not altered during the march.

Particular attention is given to the reconnoissance of the country passed over. All changes in roads, etc., are carefully noted, so that the maps of the country may be revised and corrected from time to time.

FENCING.—Instruction in fencing takes place once a week, under the direction of a field officer; all cadets and younger officers attend.

TARGET PRACTICE.—All the officers of the post are required to take part in target practice, which takes place once a week, when the weather permits. In the Artillery, target practice takes place largely at the Artillery School of Gunnery, one of the schools of practice.

RIDING.—In the Cavalry riding is taught as part of the drill, and also at the Cavalry Brigade Schools, one of the schools of practice; in the Artillery riding is taught at the Artillery School of Equitation, one of the schools of practice, as well as at drill.

Infantry Equitations.—The object of this instruction is to prepare officers, particularly of unmounted troops, for field riding.

The Corps Commander designates each year the posts at which infantry equitations are to be established; the horses are obtained from the nearest Cavalry regiment; the superintendent is a Briga-

dier of Cavalry or a field officer of Artillery or Train ; the riding-master is a properly qualified company officer or non-commissioned officer ; the hippological part is conducted by a veterinary surgeon.

To this are detailed the company officers of Infantry, Engineers, Pioneers, the Railroad Regiment and the Sanitary Troops ; Surgeons ; the officials of the Intendance and Commissary Departments ; adjutants of dismounted troops and officers of the reserve. The number detailed each year depends on the available horses and the facilities for instruction, as well as on the requirements of the officers themselves, as set forth in the recommendations of the Corps Commanders.

The course begins November 1 and ends March 31, and includes :

1. A short theoretical and practical course on riding in the field and on saddling, breaking and packing officer's riding horses.
2. Theoretical and practical instruction on the age of the horse, his anatomy and diseases, and on horse-shoeing.
3. The training of privates, serving as officers' servants and grooms, in the feeding and care of horses and in saddling, breaking and packing, practically.
4. Re-training spoiled and obstinate horses.

The officers of the Train are instructed in riding daily, and every year each train division sends two officers or Cadets to take the complete course at the Artillery Regimental Equitation. The instruction in the riding-hall is under the direction of the ranking squadron commander, graduates of the Military Riding Master's School being selected as instructors. Rides in the open are always combined with reconnoissance, tactical problems, etc.

LOGISTICS.—Each Corps Commander organizes yearly, at the posts of the Train divisions, a school of instruction in logistics to which a number of subaltern officers are detailed for a period of about six weeks, in the spring.

The theoretical course, which is combined as much as possible with practice, includes :

Wagons and harness, object, arrangement and uses of the various parts and remedies in emergencies ; harnessing and coupling of train horses ; subject-matter of the text-book prescribed for the Train ; the care of horses ; Train duty in the field ; and the supply of armies.

The instructors are generally selected from the officers of the

post. An officer of the General Staff conducts the lectures in the operative part of supply and Train duty, an official of the Intendence instructs in the administrative part, and an officer of the Train in the other branches.

ADMINISTRATIVE DUTY.—Several Cadets and Cadet-deputy-officers, who have served at least one year with the colors, and are otherwise qualified, are detailed each year for instruction in administrative duty. The scholars are ordered first to the Company offices then to the offices of Regimental adjutants to keep the books. The entire detail is not allowed to exceed one year.

RIDES OF PRACTICE.—Each year a large body of cavalry, under the direction of an officer of the General Staff, selected for the purpose, is ordered out on reconnoissance duty. The plan of action is prepared by the officer detailed as director, and requires the approval of the Inspector-General of Cavalry, the Chief of the General Staff and the Minister of War.

DESCRIPTION OF STREAMS.—The best and most energetic officers of the Pioneers are detailed each year to write up descriptions of streams, according to the manual prescribed for pioneer officers.

SPECIAL DETAILS.—The special details here considered apply only to the Engineers and Pioneers.

Detail of Officers to *practical duty*: The commanding officers of Engineers are required to have the younger officers detailed to and instructed in all their various service duties. Adjutants of battalions, commandants of detachments of miners, etc., are changed every two years, and only such officers are available for the detail as have served at least through two practical summer courses with the company.

Detail to *Military and Civil Technical Schools*: Engineer officers who have passed well at the Higher Engineer Course, and who wish to prepare themselves as professors, in military or technical branches, at the Technical Military Academy, or for other purposes, are detailed to one of the subdivisions of the Technical and Administrative Military Committee, either to attend lectures at the technical high school or to serve in the branch selected in the Military Committee. To supply himself with the necessary books, etc., each student is allowed 10 florins. The tuition is paid by the Military Committee. The students are examined yearly, in presence of a member of the Committee, and the result is re-

ported to the War Department. The officers are pledged to make good the time of service spent at such institution.

Detail to Building Bureaux.—Officers of Engineers, who passed well at the Higher Engineer Course, are also detailed to Military Building or Engineer Bureaux to learn administrative duty or the construction of buildings. They may also be sent to the larger civil or railroad constructions in the country.

Detail to Railroads.—Several Pioneer officers are detailed each year to railroad construction and railroads.

Detail to Technical High Schools.—To encourage ambitious subalterns in the study of the higher branches of pioneer work, and to obtain good teachers for the Pioneer Cadet School, two officers are, on their own application, sent yearly to take a course of lectures at technical high schools.

On completion of the course the officers make a report of the lectures attended to the regimental commander, who then recommends their detail to the Pioneer Cadet School, or makes them lecturers on technical subjects at the officers' meetings.

APPLICATIONS.

My first thought in presenting this paper was to give simply an account of the manner of carrying on the instruction of officers at posts in the Austrian army, and leave every one to draw his own conclusions, but I am so deeply convinced of the great importance of this subject, and its easy application to our own army, that I have ventured a little farther. Considerable interest has been evinced quite recently on this subject, but I think that nearly every one who has given the subject any thought has an entirely erroneous idea of the difficulties in the way of its successful introduction. I refer, of course, more particularly to the study of Minor Tactics in a purely practical way; by the solution of problems in the field. I think, if you will carefully investigate the matter, you will see that it is no more difficult or intricate than the subject of drill tactics. It is merely the application of the principles of minor tactics to particular situations, but more than that it inspires confidence by the practice involved.

We have all studied Minor Tactics, but if you were in the field and suddenly received an order, would you be at all certain of the best way of executing it? If, on the contrary, you had been tried on various occasions with problems of this same kind,

and had been induced to study and think of the best way of carrying out similar orders under various conditions, would you not feel more confident, and consequently proceed with greater energy?

Ours is a practical nation, and this subject, which is so essentially practical in all its bearings, will be sure to commend itself to every intelligent officer, and I have no doubt that before many years are past it will be as familiar a subject as drill tactics is to-day. There has been a strong feeling for some time tending towards having some sort of field maneuvers, not only for the regular army, but more particularly for the benefit of the militia. Without a previous study of Minor Tactics such maneuvers would be without much practical result, because you cannot read unless you first learn your A B C, and the A B C of the Art of War is Minor Tactics. I do not wish to be understood, however, as disapproving the idea of having maneuvers; on the contrary, much benefit would undoubtedly result, but my interest is deeper: I would have the maneuvers a grand success and avoid the possibility of disappointment. Teach the officers their Minor Tactics, in however simple and crude a way, and they will then take an interest far beyond the mere obedience of orders or the doing of duty merely because it is duty. Progress in anything inspires to work.

This subject is, in my opinion, of such great importance, and involves so completely the military duties required of officers in actual service, that the principles should be taught in a course of Minor Tactics and Military Geography, and practiced by the solution of practical problems in the field, as a part of the daily drill or other field exercises, not only at all posts, but also at the schools of application, and, if possible, at the Military Academy in its simpler and more fundamental forms. At the schools of application it should be the most important subject of the course, involving, as it does, the application of all other subjects properly there taught.

That this is perfectly practicable is evident from the fact that in Austria, Germany and France, and in the English Army in India it constitutes to-day the all-important subject in the armies. But, in order to show more clearly its practicability in our army, we will proceed to outline a system of instruction such as may be conducted at any of our posts.

PROPOSED SYSTEM OF INSTRUCTION.

The course of instruction is divided into a winter and a summer term, the former extending from the first of November to the first of March, the latter from the fifteenth of June to the fifteenth of September.

Winter Term.—During the winter term the problems are solved in-doors by the simple use of maps.

The post commander, or some officer detailed for the purpose, lectures every second and fourth Monday of each month on the Principles of Minor Tactics and Military Geography involved in the next succeeding problem to be solved.

The subject-matter of such lectures can be found in :

- "Strategy and Tactics." Dufour. (Craighill, Wheeler.)
- "Outpost Duty." Hamley.
- "Tactical Deductions from the War of 1870-71." Boguslawski. (Graham.)
- "Minor Tactics." Clery.
- "Cavalry in Modern War." Trench.
- "The Elements of Modern Tactics." Shaw.
- "Field Artillery." Pratt.
- "Les Éléments de la Tactique." Meckel.

In case no maps of the surrounding country are available, one or more officers are detailed to make rapid foot or mounted reconnoissances and topographical sketches which will serve the purpose.

The officers of the post are assembled every second and fourth Thursday of the month, a problem is dictated to them, and they are required to solve it at once on paper, and submit the solution to the commander in one or two hours, depending on the character of the problem.

Summer Term.—During the summer term there are no lectures; problems similar to those solved in the winter term, but more elementary and involving smaller commands, are solved on the ground itself, first without troops and then practically with troops. On every second and fourth Thursday of the month the officers proceed to some point near the garrison, where a problem is dictated, with the aid of maps or topographical sketches, and discussed and solved orally; on the following Monday it is, whenever practicable, executed practically with troops, after which a written solution is submitted.

The time actually required for this work will not exceed five hours a month.

EXAMPLE.

In conclusion, in order to show how easy it is to construct simple problems for even the smallest of our posts, and involving the simplest duties of subaltern officers, we will take the case of Fort Union and suppose one squadron of cavalry stationed there.

A cavalry brigade encamped at Fort Union is ordered to advance on the road Fort Union—Puerto del Cañon, towards the Cañon of the Mora River, and sends a squadron ahead with the following orders :

Problem.—You will advance with your squadron at 6 A. M. on the road Fort Union—Puerto del Cañon, clearing up the ground between the road Fort Union—Loma Parda on one side and the road Fort Union—Johnson's on the other, and halt in a secured position on the line Loma Parda—Tiptonville, and await orders to advance.

Hostile cavalry was seen yesterday beyond the Cañon of the Mora, near Los Alamos.

Subject-matter of Solution.—1. Military estimation of the terrain with reference to the problem.

2. Leading thought in the execution.
3. Orders issued.
4. Tracing of the position of the squadron, with all its detachments, during the secured halt.

I feel, in concluding this paper, that I have made but a weak effort to inspire an interest in this subject, for I would like to present the matter so forcibly that you would all be induced to take it up. However, if any are interested I hope they will not be discouraged by the apparent difficulties in the way, for every little effort, however insignificant apparently, will help the general result.

Since on this subject I have already admitted several quotations which have occurred to my memory upon writing this paper, I will conclude it with a little Persian fable: "A drop of water fell out of a cloud into the sea, and finding itself lost in such an immensity of fluid matter, broke out into the following reflection: 'Alas, what an inconsiderable creature am I in this prodigious ocean of waters! my existence is of no concern to the universe; I am reduced to a kind of nothing, and am less than the least of the works of God.' It so happened that an oyster, which lay in the neighborhood of this drop, chanced to gape and swallow it up in the midst of this, his humble soliloquy. The drop," says the fable, "lay a great while hardening in the shell, until by degrees it was ripened into a pearl, which, falling into the hands of a diver, after a long series of adventures, is at present that famous pearl which is fixed on the top of the Persian diadem."

Addison.

THE TRANSPORTATION OF THE DISABLED, WITH
SPECIAL REFERENCE TO CONVEYANCE BY
HUMAN BEARERS.*

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WITH the growth of the world in civilization, humanity has begun to supplant barbarity in the treatment of man by his fellow-man. Annihilation of the enemy is a characteristic of the savage massacre, while civilized warfare attempts only to weaken the enemy to such an extent as to cause him to yield the point in dispute. Instead of seeking the death of a disabled opponent, the ethics of the time tend toward the removal of his disability and the keeping him under such restraint as to prevent his engaging in further hostilities.

An important feature of the new order of things then is the removal of the wounded from the field of battle to the most desirable place for the treatment of their injuries. For the proper performance of this duty thoroughly drilled men and suitable appliances are essential. During the War of the Rebellion, the necessity for organized means of transporting the wounded culminated in the formation of an ambulance corps, which rendered yeoman service during the latter part of that conflict, but in the reorganization of the army, after peace had been declared, this corps was eliminated. During the long period of peace that has

* A lecture delivered before the Military Service Institution of the United States, at Governor's Island, March 21, 1888. The lecture was illustrated by the actual performance of the methods by trained bearers.

The illustrations of this paper are mainly reproductions of photographs, for which the writer wishes to acknowledge his indebtedness to the skill and courtesy of Lieut.-Col. Anton Hegar, Surgeon U. S. Army.

since elapsed in our country, European nations have been developing the subject of aid to the injured still further, and the experience derived from the more recent wars, in which they have been engaged, has thrown new light upon the requirements of field sanitary service. After many years of effort, the Medical Department of the United States Army has succeeded in obtaining the organization of a Hospital Corps upon a plan so broad and liberal as to justify the highest hopes as to the work to be accomplished by it. The number of men in the corps is as yet unlimited by legislation, and additional to the enlisted strength of the Army as prescribed by law, and when it has its full complement, according to existing orders, it will number from eight hundred to a thousand men, including Hospital Stewards and Acting Hospital Stewards. In addition to this number, four men in each battery, troop, and company in the Army are designated as Company Bearers, and are to be instructed in litter bearing and in first aid in medical and surgical emergencies. Although not prescribed in orders, it has been suggested that the members of regimental and other bands, whose duties are of a non-combatant nature, should be utilized in case of an action. When possible, then, these men should be drilled in carrying the wounded in addition to those already named. The Militia of the various States are falling into line, and notably the New York State National Guard, at the suggestion of Major Fowler, Surgeon of the Second Brigade, has already organized an ambulance corps, which is now under active instruction.

The material for rendering aid to the sick and wounded having been thus made available, the question as to the best means of utilizing it arises. The first point of importance in case of a disabled man is to bring him to the point where he can receive the attention of the surgeon ; in case of an action, this would be the first dressing station near the line of battle. This must of necessity be done by hand, with regularly constructed or extemporized litters, or without assisting apparatus. In any case, a definite, uniform system of handling the injured should be employed. The required movements may be executed in silence according to a prescribed rhythm to which the bearers should have become habituated. After some considerable observation of the soldier, however, I am forced to the conviction that this plan is wholly impracticable, particularly for Company Bearers, because of the large amount of drill necessary to train them to

properly execute the movements without distinct commands, and, owing to the limited amount of time allowed for the training of these bearers, it would be impossible to drill them sufficiently to cause them to execute the movements rhythmically without verbal orders.

Then, having arrived at the conclusion that the movements must be executed in obedience to certain commands, I have formulated the following requisites for the proper carriage of the disabled :

1. A system of manipulation of the hand-litter should first be established, and the execution of extemporized methods should be adapted to it.

2. The maneuvers should be so arranged as to prevent confusion and preserve smoothness, and the commands should be so expressed as to bring this about.

3. In this connection the small number of men commonly available for drill should be considered, as well as convenience for expansion in case of an increase of forces.

4. The commands should be so expressed as to convey to the bearers in the clearest possible manner the idea of the maneuver to be executed. Experience in military tactics has shown that this is best accomplished by (a) a preparatory command, to give the men warning of the impending movement, followed by (b) a command of execution to cause the maneuver.

5. The same command should not be applied to different movements in bearer drill. The mention of this point may seem rather unnecessary, but the repetition of this error in nearly every plan for bearer drill, that I have seen, has impressed its importance upon me.

6. There should be an analogy with the authorized tactics for other arms of the service. (a). When the same movement occurs in bearer drill and in the drill of other arms of the service, the movement should be executed in the same manner and in obedience to the same commands. (b). The same command should not be applied to different movements in the authorized tactics and in bearer drill, because the use of commands, conflicting with those of other arms of the service, would be a constant source of confusion and demoralization to the company-bearers who are required to be familiar with both.

The unit of bearer drill with the litter should be four men, a number which experience has shown to be necessary for the

prompt and efficient conveyance of the insensible, to provide proper relief for the bearers, and to afford additional assistance in certain maneuvers. The unit of the bearer drill of the St. John's Ambulance Association is three men, and under the stress of necessity, this may be sufficient for some civilian purposes, but it will not answer for military emergencies. Any organization for the purpose of litter-bearing then, should consist of multiples of four.

THE FORMATION OF THE BEARER COMPANY.

These fours should be united into a company for purposes of organization. In forming the company, all bearers, regardless of corps, should be made by the senior Hospital Steward to *fall in* in single rank without arms, according to height, the tallest at the right, and facing to the right. Junior Hospital Stewards and Acting Hospital Stewards should act as file-closers and take their posts two yards in rear of the line, the senior at the right, the junior at the left, and others in order of seniority, from right to left.

The senior Hospital Steward should then command

1. *Left*, 2. FACE,

upon which the men face to the left. He then calls the roll, after which he commands

1. *Count*, 2. FOURS,

in order to divide the company into the proper bearer squads. After the squads are thus designated, he commands

1. *Twos left*, 2. MARCH, 3. HALT.

This movement being executed, he commands

1. *Right*, 2. FACE,

following it by

1. *Right*, 2. DRESS, 3. FRONT,

all these movements being executed as prescribed in the authorized Infantry Tactics.

By this means he has obtained a two-rank formation, with the odd numbers (1 and 3) of each set of fours in the front rank, and the even numbers (2 and 4) of each set of fours in the rear rank. The advantage of this arrangement will appear in marching the various squads to the litters, when it will be seen that, *without any confusion and in the simplest manner possible, the bearers nearest the same height will be paired.* The company then being

formed in this manner, the senior Hospital Steward passes down the front of the front rank to the center, advances six yards, salutes and reports to the medical officer in command, who stands twelve yards in front of the center of the line, and who then commands

Take Your Post,

upon which the senior Steward faces about and returns to a position in and at the extreme right of the front rank. The medical officer then assumes command.

At the conclusion of all drills and ceremonies, the medical officer having brought the company back into the position just described, addresses to the senior Hospital Steward the command:

Dismiss the Company.

The Steward then marches the company to the point where it is to be dismissed, when he takes his post six yards in front of the center and facing it, and dismisses it with the command

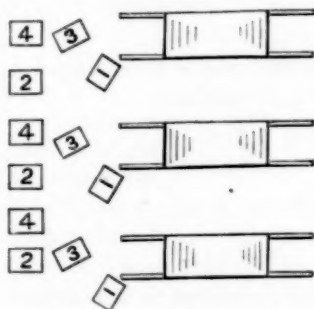
1. *Break ranks, 2. MARCH.*

THE MANAGEMENT OF THE HAND-LITTER.

The medical officer, having assumed command of the company formed as prescribed in the preceding section, sees that a number

of litters corresponding to the number of complete sets of fours present are placed in a line parallel to the company, the litters perpendicular to the line and three yards apart. I believe that the Halstead litter now supplied by the Medical Department of the Army is the most generally useful, while it is simple in construction, thoroughly portable, and exceedingly manageable. It consists of two ash side-bars eight feet in length by two inches in diameter, connected by a strip of canvas six feet long and two feet broad. The side-bars are connected by two flat bars of wrought-iron, hinged in the middle, to permit the litter to be folded, while just within the iron bars are situated the legs, also arranged so as to fold.

Fig. 1.—Position of bearers just after the command: *To your posts—march!*



The medical officer assigns to the hospital stewards and act-

ing hospital stewards such duties in connection with the drill as he may consider advisable. If there is an incomplete squad, a steward may be assigned to fill a vacancy, or the squad may act as injured men in the drill, practice the extemporized methods of carrying the wounded described hereafter, or perform such other duties as may be considered advisable.

Each set of fours constitutes a bearer squad and forms a drill unit complete in itself, as I have already remarked. Nos. 1 and 2 are the bearers proper, and Nos. 3 and 4 are the relief party. No. 4 is the chief of squad and gives all the commands to it. If No. 4 is absent or disabled, the command devolves upon No. 3, and if the bearer squad is reduced to two, the rear bearer is the commander.

The company and litter then being arranged as indicated, the medical officer commands

1. *Right*, 2. *FACE*.

This command having been executed, he follows with

1. *To your posts*, 2. *MARCH*.

At *march*, Nos. 1 and 3 move forward until Nos. 2 and 4 are able to fall in directly behind them, as shown in Fig. 1. They then march to the left side of the litter and pass, No. 1 completely around it, taking his post between the front handles; No. 3 following to the middle of the right side of the litter; No. 2 to the rear handles, while No. 4 stops at the middle of the left side of the litter and faces about.

Now it will be observed that in forming the company the men were sized from right to left, and that consequently Nos. 1 and 2 are more nearly the same size



Fig. 2.—Position of the bearers about the litters.

than Nos. 1 and 3 or 1 and 4. In the same way Nos. 3 and 4 are more nearly the same size than Nos. 1 and 4 or 2 and 4. We have then both our bearers proper and our relief party matched in size, and this without the least confusion or conflict. This was the end sought in devising this formation, which was selected from a large number which were subjected to experiment, because of its simplicity and ease of execution.

To bring the company back into the company formation, the

litter squads should be made to bring the litters into a line parallel with and facing the proposed line of the company and three yards from it. The senior Hospital Steward then takes a position at the extreme left of the proposed line and on the line of the rear rank. The medical officer then commands

1. *Into ranks*, 2. MARCH.

At *march*, the bearers pass about the litter, marching in the reverse of the direction taken in "*To your posts; march.*" No. 4 of the right-hand squad advances and takes his position in the line indicated by the Hospital Steward and facing to the left; No. 2 follows and takes his place immediately behind No. 4; No. 3 follows and takes his position at the right of No. 4, and No. 1 follows and takes his position at the right of No. 2. The other squads advance in the same way and simultaneously with the right-hand squad, but each forms on No. 2 of the preceding squad instead of on the Hospital Steward. The medical officer then commands: *Right face*, in obedience to which the men face to the right and the senior Hospital Steward passes in front of the line to his place at the right of the line.

THE MANIPULATION OF THE LITTER.

The company is now fully formed, and the officer may assign parts of it to any distinct duties, or cause them to be dismissed, as already prescribed.

By the order *To your posts, march*, the company is resolved into its component elements, the litter squads.

The handles of the litter should be held in the hands, carried by the side. If a litter is carried upon the bearers' shoulders, the height at which he is carried is a continual source of anxiety to the patient. If one of the bearers should stumble or fall it would be a positive source of danger. It is a matter of history that General Stonewall Jackson died from injuries aggravated by falling from a litter borne on the bearers' shoulders, when one of the bearers fell wounded.

The bearers should take a firm but not springy step, about twenty inches in length, with the knees rather bent and the hips moved as little as possible. Theoretically, the best step for them to take is the "mountain step," in which the bearers' feet fall upon the ground in succession—a gait similar to that of a "single-foot" horse. Practically, the soldier is so accustomed to keeping step that it would be impracticable to train company

bearers in this step. A disagreeable swinging motion is given to the litter if both bearers step off with the same foot, but this can be obviated by the "break-step," in which the rear bearer steps off with his right foot, while the other bearers step off as usual with the left foot. Practically, then, this is the best gait for use in litter bearing.

The litter should be held level. This is obtained on level ground by having the bearers as nearly as possible of the same height, as already mentioned. In passing over uneven ground, the bearers should act in concert, so as to still maintain the level, the bearer on the higher ground lowering his end and the bearer on the lower ground raising his end. If a declivity is so marked that it is impossible to keep the litter level, it should be carried so that the patient's head may be higher than his feet, unless he is suffering from a fracture of the lower extremity, when the reverse order should be adopted.

The litter should not be carried over a fence or wall, or across a ditch or marked depression, except when it is absolutely impossible for the bearers to pass around them. If this is impracticable, a portion of the fence or wall should be torn down; the ditch should be crossed by lowering the litter on the margin of the ditch while the first bearer descends into it; he then draws his end of the litter out over the ditch and holds it while the rear bearer descends and lifts his end down; in ascending on the other side, the process is reversed.

The litter should always be carried with the patient's feet forward, except in case of a fracture of the lower extremity, and in making a marked ascent. It can readily be seen that this will conduce greatly to the comfort of the patient.

The litter-squad having been marched to their posts, the squad is commanded by No. 4, who commands

1. *Lift*, 2. LITTER.

At *litter*, Nos. 3 and 4 stand fast, while Nos. 1 and 2 stoop, adjust the straps about the neck and shoulders, and grasp the handles of the litter, as in Fig. 3. (Two) They gently lift the litter by resuming an erect posture.



Fig. 3.—"Lift Litter."

To place the litter upon the ground, No. 4 commands

1. *Lower*, 2. *LITTER*.

At *lower*, Nos. 3 and 4 face inward toward the litter, and grasp its legs, as in Fig. 4.

At *litter*, all four gently stoop until the litter rests upon the ground, Nos. 3 and 4 guiding the legs, and (Two) resume an erect posture, all facing in the direction of the litter.

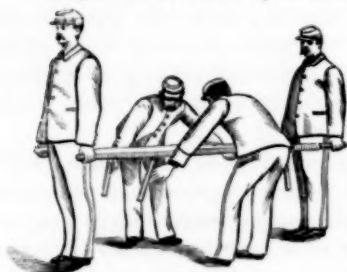


Fig. 4.—“Lower.”

In marching, it should be remembered that the rear bearer steps off with the right foot, the others with the left foot. If it be desired to march directly forward, No. 4 commands, 1. *Forward*, 2. *MARCH*; if it is desired to turn at a right angle, the direction is changed by the command, 1. *Litter Left* (or *Right*), 2. *MARCH*; or if it is desired to turn obliquely, the direction is changed by the command, 1. *Litter Half Left* (or *Right*), 2. *MARCH*.

When the destination is reached, or when it is desired to rest or change bearers, No. 4 commands, 1. *Litter*, 2. *HALT*.

To change bearers, the litter being lowered, No. 4 commands
1. *Change*, 2. *MARCH*, 3. *HALT*.

At *change*, No. 4 faces to the rear.

At *march*, the squad marches about the litter in the direction taken when they marched to their posts. When No. 1 reaches the place vacated by No. 4, No. 4 that vacated by No. 2, No. 2 that vacated by No. 3, and No. 3 that vacated by No. 1, the command *Halt* is given. Nos. 3 and 4 then become the bearers, and Nos. 1 and 2 the relief party. When it is desired to resume the original position, the march is continued in the same direction, the command *Halt*, not being given until the desired position is gained.

THE MANAGEMENT OF THE LITTER AT THE AMBULANCE.

To load a litter upon an ambulance, the same general line of action may be pursued, care being taken to differentiate the commands from those of ordinary litter exercises. A litter having been brought with its front handles at the rear of the ambulance, its long axis in the long axis of the ambulance, No. 4 commands

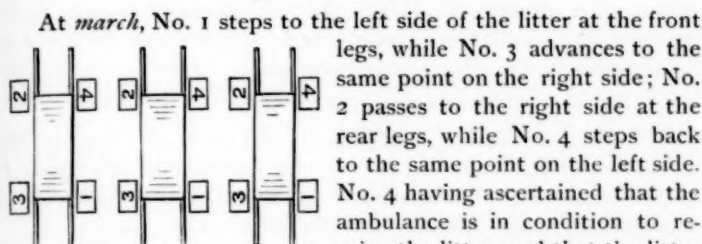
1. *Prepare to Load*, 2. MARCH.

Fig. 5.—Position of bearers after the command, *Prepare to load*.

commands

1. *Raise*, 2. LITTER.

At *raise*, the squad face toward the litter; at *litter*, they stoop, and with the palms upward, grasp the side poles of the litter, and (Two) gently raise it to the level of the rollers of the ambulance, upon which it is to be placed. No 4 then commands

1. *Load*, 2. LITTER.

At *litter*, each bearer folds up the leg adjacent to him, and the litter is gently passed forward on to the rear roller, when (Two) Nos. 1 and 3 step back to the right and left one yard, while Nos. 2 and 4 push the litter gently in, its full length, and (Three) step back facing distance, while Nos. 1 and 3 return to their places, and face toward the ambulance.

The squad may now be marched to a new litter, or into ranks. In the former case, Nos. 1 and 3 face to the left, and Nos. 2 and 4 to the right, and march about a central point, falling in in the order 1, 3, 2, 4. In the latter case the movement is reversed.

To unload a litter from an ambulance, a squad should be marched to the rear of the ambulance and formed as described in the preceding paragraph, Nos. 1 and 3 in the front rank, and Nos. 4 and 2 in the rear rank. No. 4 then commands

1. *Unload*, 2. LITTER.

At *litter*, Nos. 1 and 3 face inward, and step back one yard to the right and left respectively; (Two) Nos. 2 and 4 step forward, and grasping the rear handles, draw the litter gently out, seizing the litter-poles at the rear legs, with the palms upward. (Three) Nos. 1 and 3 advance and grasp the litter poles at the front legs, with the palms upward, and (Four) the litter is drawn clear of the ambulance. If the ambulance contains four litters,

the first should be carried nine yards to the rear before being set down; if it contains two litters, the first should be carried three yards to the rear; if but one, it may be stopped one yard in rear of the ambulance. No. 4 then commands

1. *Depress*, 2. LITTER.

At *litter*, the bearers gently stoop and lower the litter to the ground, each bearer seeing that the leg adjacent to his hands is in proper position, (Two) arise to an erect posture and (Three) assume their proper places about the litter.

In case it becomes necessary for a squad to assume entire charge of an ambulance, when the litter has been brought to the ambulance No. 3 takes his position as ambulance driver. No. 4 sees that the ambulance and litter are prepared, and gives the commands as before. In this case No. 2 passes forward on the right side to the front legs, while No. 4 assumes sole charge of the rear end, standing between the handles. The litter is then loaded by the same commands as with four bearers, Nos. 1 and 2 remaining at the sides of the litter after the front handles have been deposited upon the rollers and helping to push it into the ambulance. The ambulance is unloaded by three bearers, with the same commands as for four, the bearers being assigned to the same posts as when loading.

It not infrequently occurs that the services of litter-bearers are demanded when they are under arms or mounted. Maneuvers, by which both horses and arms may be satisfactorily disposed of or utilized so as not to interfere with the proper performance of the bearers' duties, have been devised, but it would seem best that the present paper be confined strictly to the means of handling the disabled, and not encumbered with accessory details.

THE TRANSFER OF A PATIENT TO OR FROM A LITTER.

Perfect familiarity with the manipulation of an empty litter having been obtained, bearers should be taught how to transfer a patient to and from the litter. After a considerable number of experiments, the following methods have been selected as the most satisfactory:

The patient lying at full length, on his back if the character of his injuries will permit, the empty litter should be brought with its front handles at his head and its long axis in the direction of the patient. No. 4 then commands

1. *To the patient*, 2. MARCH.

At *march*, Nos. 1 and 2 pass on the right of the patient, No. 1 to his knees and No. 3 to his elbow, while No. 2 passes on the left to his waist, all facing toward the patient. No. 4 steps to the left to permit No. 2 to pass between himself and the litter, then he takes charge of the injured part, or supports the head. No. 4 then commands

1. *Lift*, 2. PATIENT.

At *patient*, all kneel, (Two) No. 1 passes his hands with the palms uppermost, the left under the patient's calves and the right under his ankles, the fingers hooking up on the opposite side of the patient; No. 2 passes his hands with the palms uppermost, the right under the back between the loins and the shoulder-blades, and the left under the thighs at their junction with the body, the hands, if possible, hooking up on the farther side of the patient; No. 3 passes his hands similarly, the left under the shoulders and the right under the loins, the hands hooking up, if possible, on the opposite side. (Three) All arise, first upon one foot and knee, then upon both feet.

Or, at *patient*, all kneel upon one knee, (Two) No. 1 passes his hands as above, while Nos. 2 and 3 each pass one hand under the patient's thighs at their junction with the body, and the other under the back close up, under the arm-pits, the left palm down and the right palm up. Each bearer then grasps his companion's corresponding wrist and (Three) all arise. The grip is shown in Fig. 6, showing a two-handed seat, and this grip in the present instance is to be taken with both hands.

The first of these methods is the best adapted for a perfectly helpless patient, is the more comfortable for the patient, and the more easily performed in transferring a patient from litter to bed, or from bed to litter; while the second is the more easily performed in transferring a patient from ground to litter, and is rendered still more easy if the patient can help himself by placing his hands upon the bearer's shoulders.

The patient then being lifted, No. 4 commands

1. *To the litter*, 2. MARCH, 3. HALT.

At *march*, the bearers move gently with side steps until the



Fig. 6.—Two-handed seat, to show the grip of the hands.

patient is held over the litter, when, at *halt*, they stop. No. 4 then commands

1. *Lower*, 2. *PATIENT*.

At *patient*, the bearers gently stoop until the patient rests upon the litter, (Two) withdraw their arms, resume an erect posture and (Three) take their proper posts. No. 4 sees that the patient and the injured parts are disposed in the most convenient and comfortable position possible, and that the head rests easily upon a pillow formed by a coat, knapsack, blanket, or other similar article.

In removing a patient from one litter to another, or from a litter to a bed, the litter should be placed with the patient's head at the foot of the new litter or the bed and the preceding procedure followed.

EXTEMPORIZED METHODS OF MOVING THE WOUNDED.

But every old campaigner will remember that it was rather the rule than the exception when the supply trains were left behind, and he will readily recognize the fact that, as occurred in Lord Wolseley's Soudan expedition, the paraphernalia of the ambulance corps may be wanting. Again, small scouting parties of from two to ten men will not be burdened with litters. In cases such as these a knowledge of extemporized means of transporting the sick and wounded may be of the greatest advantage. Indeed, I am in very serious doubt as to whether it may not be of even greater importance than litter exercises themselves. In view of these facts, I have been astonished at the slight amount of attention that has been devoted to these methods. Thousands of pages have been written upon various styles of litters and ambulances, immense sums have been laid out in the construction of complicated hospital-ships and hospital-cars for large numbers of the sick, but the conveyance of the single man in case of the absence or insufficiency of this elaborate paraphernalia seems to have been almost entirely neglected.

In the execution of these methods, as in litter bearing, the utmost gentleness and care should be observed. For practice, they should be divided into clearly marked steps, each of which should be distinctly performed, also, as in litter bearing.

I have divided these methods into three classes :

- A. Methods by a single bearer ;
- B. Methods by two bearers ;
- C. Methods by three or more bearers.

A. METHODS BY A SINGLE BEARER.

I consider these methods to be in reality the most important of all, both to the soldier and the civilian. The instances where a familiarity with these methods may be the means of saving life in case of fire and other accidents in towns and cities, will readily occur to the reader, while one who has seen frontier service cannot fail to remember numerous occasions where they might have been of vital service.

These methods naturally fall into three groups: I. Where the patient is carried in the bearer's arms; II. Where the patient is carried on the bearer's back; III. Where the patient is carried on the bearer's shoulder. In all these cases the most important question is how to lift the patient into a position in which he may readily be carried—a matter of no little difficulty when the patient is insensible or unable to assist, and particularly if he be a heavy adult. A year or two ago I made a large number of experiments with a view to devising a means of facilitating this procedure, and have continued these experiments during the past year, until I have finally settled upon the procedures described in connection with the following methods:

I. *Where the patient is carried in the bearer's arms.*—These methods are adapted to carriage for short distances and for those cases where it is thought necessary, for any reason, to have the patient under the eye of the bearer. There are three of these:

1. The patient lying on the ground, (1) turn him face downward, (2) stand astride of him and, with your hands in his arm-pits, raise him to a kneeling posture, (3) shift your hands about his body and clasp them in front, and (4) lift him upon his feet; (5) then, still holding him erect, shift yourself so that his right side will be against you and your hands under his left arm-pit; (6) then, retaining your left hand and arm in place, pass your right arm behind his thighs and (7) lift him into your arms. By this plan, a man can be lifted into the arms who could not otherwise be raised twelve inches from the floor. To lay the patient down from this position, (1) keeping the left hand and arm in place lower the patient's inferior extremities by lowering the right arm (2) the heels resting on the ground or cot, the left hand should be



Fig. 7.—Sixth motion in lifting patient into arms.

clasped *in situ* by the right, and (3) the patient gently lowered on to his back.

2. The patient may be *carried* with somewhat greater ease by taking a sheet, shelter tent or similar article, and tying the two opposite corners together, then (1) passing the broad center of the sheet under the patients loins and buttocks, and (2) the knot over the bearer's head with his right arm through the loop; then (3) slipping the left hand under the patient's shoulders and the right under his thighs, the bearer rises to an erect posture. To lower the patient, the bearer simply bends forward until he rest upon the ground or cot.

3. A sort of harness has been devised by Hospital Steward Harbers, to be substituted for the sheet in the preceding method (2).

II. *Where the patient is carried on the bearer's back.*—A patient can be carried upon the bearer's back with much less exertion than in his arms. These methods are consequently better adapted to carriage for any considerable distance. There are four principal varieties of these methods:

1. The patient "pick-a-back."—(a) This is the oldest of these methods and is available, without assistance, only when the patient is able to assist by clasping his arms about the bearer's neck. It is best performed in the following manner:

(1) Let the patient, seated upon the ground facing you, clasp his arms about your neck (2) with your hands under his arm-pits



Fig. 8.—Fourth motion in lifting patient astride of back.

raise him to a kneeling posture, (3) then shifting the arms about his body raise him to his feet; (4) then letting him support himself by his arms about your neck and assisting him with your hands, face carefully about; (5) then grasp the patient's thighs on either side, and draw them astride of your loins. The patient is lowered by reversing the movements of lifting him.

(b) An insensible patient can best be carried by the methods to be described presently, but if for any reason it is desired to use this method, after the patient is gotten upon the back with the help of other assistants, he may be kept in place by passing a broad strap—a belt for example—about his back under his arms and up over the bearer's forehead or about his chest.

(c) A sort of saddle has been devised by Fischer which relieves the bearer from supporting the patient's thighs, and enables him to devote his attention to keeping the patient in place with a strap passed about his back.

2. Analogous to Fischer's method is the plan of carrying the patient seated in a chair strapped upon the bearer's back.

3. Another method is much advocated by foreign authors, and may be of advantage in countries where the people are accustomed to carrying heavy burdens upon the head. But it is wholly unadapted to the American physique, and I only mention it as a curiosity and to condemn it. It is as follows: (1) Seat the patient with the knees and hips bent, the head resting on the knees; (2) then pass a long band—a belt for example—about the patient under his knees and arms; (3) then crouching down behind him back to back, pass the strap over your forehead and (4) arise. The strap should be short enough to bring the weight upon the shoulders and the upper part of the back.

4. The following method is a modification of one recommended by Capt. Shaw of the London Fire Department. It is comfortable to the patient and easy for the bearer, and is of particular value when the patient is not insensible, but at the same time is unable to render any assistance to the bearer. (1) Turn the patient face downward; (2) seize him under each arm-pit and raise him to his knees; (3) shift the arms about his waist, clasp the hands, and lift the patient to his feet; (4) then retaining the right hand in position grasp the patient's left hand with your left hand and draw his left arm back about your neck, bringing the hand down in front of your chest; (5) then, stooping slightly, pass your right arm around in front of the patient's right thigh and grasp it, whereupon he will fall across your back; (6) resume the erect posture and balance the body on your back.

III. *The patient over the bearer's shoulder.*—

This method is of advantage because of the ease with which the patient can be carried, and because it leaves one hand free for other purposes. Another important feature is that it enables the bearer to thoroughly control the patient, a point of great advantage in case of a delirious or refractory patient. (1) Turn the patient upon his face; (2) standing at the head of the patient, seize him under his arm-pits and lift him



Fig. 9.—Patient across bearer's back.

to his knees, facing you; (3) shift your arms about his waist and raise him to an erect posture, (4) at the same time placing your right shoulder at his stomach so that his body falls over upon your back: (5) pass your right hand forward between his thighs;



Fig. 10.—Patient over bearer's shoulder.

(6) With your left hand grasp the patient's right hand and draw it under your left armpit, until you can grasp his left wrist with your right hand; (7) resume the erect posture.

In case of a female, where the skirts would make it inconvenient to pass the arm between the thighs, if the patient is not too large, the right hand can be passed around both thighs.

To lower the patient (1) the bearer drops on his knees, (2) bends greatly forward until the patient rests upon his buttocks, and (3) withdraws his hands and resumes an erect posture.

These methods for a single bearer are sufficient to meet any emergency which may arise and afford a sufficient variety to give to a bearer the rest to be derived from a change of position.

B. METHODS BY TWO BEARERS.

While, in many instances, it is really easier for one bearer to carry a patient by the methods which I have given, than for two to unite in carrying him, yet it is usually rather more comfortable for the patient to be carried by two, and for any considerable distance it is easier for the bearers. The methods by two bearers may be considered in three groups: I. Where the patient is carried without assisting apparatus. II. Where the patient is carried upon apparatus extemporaneously constructed for the purpose. III. Where the patient is carried upon articles diverted to that use.

I. *Where the patient is carried without assisting apparatus.*—In the execution of these methods, the action should be divided as in transferring a patient to or from a litter, and be performed in obedience to the same commands, substituting *Forward March* for *To the litter March*.

1. Four-handed seat.—This is the “lady’s chair” or “sedan

chair" of the children, and makes a very comfortable seat for a patient who is able to help himself to some extent. To form it, each bearer grasps his own left wrist or forearm with his right hand, and with his left hand grasps his fellow's right wrist or forearm. The patient, sitting upon the seat thus formed, helps to support himself by throwing his arms over the shoulders of the bearers.



Fig. 11.—Four-handed seat.

2. Three-handed seat with back.—This is recommended by Longmore as being the most desirable of these methods, but while it is undoubtedly useful, my own observation has taught me that it is inferior to the third method. To form the three-handed seat, the right hand bearer grasps his own left forearm with his right hand, and the left forearm of his fellow with his left hand; the left hand bearer grasps with his left hand the right forearm, and with his right hand, the left shoulder of his fellow.



Fig. 12.—Three-handed seat.

3. Two-handed seat with back.—This method I consider the most comfortable for the patient and the least fatiguing for the bearers and in every way the most desirable of the methods by two bearers. The right hand bearer grasps, with his right hand, the left wrist, and with his left hand, the right shoulder of his fellow; the left hand bearer grasps, with his left hand the right wrist and with his right hand the left shoulder of his fellow.



Fig. 13.—Two-handed seat.

4. Bearers at knees and shoulders.—The front bearer, taking his position between the patient's thighs, grasps them on either side and, on lifting, elevates them to just above his hips; the rear bearer raises the patient's head until its back rests upon his breast, then passes his arms under the patient's arm-pits from behind, and interlocks the fingers of his two hands in front. This method is comfortable for the patient, but not as easy for the bearers as some of the others. It is well adapted to the carriage of exceedingly weak patients.

II. *Where the patient is carried upon apparatus extemporaneously constructed for the purpose.*—The procedures under this head may be grouped into three classes. In the first two the patient is seated, in the third he is supine. In the first two the patient should be gently lifted by one bearer while the apparatus is placed beneath him; then he should be lifted and carried as in transferring a patient to or from a litter. In the third class, the patient should be transferred to the extemporized litter, and this litter should be manipulated in the same way as the regulation hand-litter.



Fig. 14.—Patient carried by bearers at knees and shoulders.

1. A seat may be constructed by forming a ring of leather, rope, canvas, cloth, etc. The bearers grasp opposite sides of this ring while the patient sits upon it. For ordinary purposes this is inferior to the two-handed seat already described; when bearers are engaged in bearing the sick for a considerable length of time, the hands become cramped and fatigued, and in this case, the ring is of service. The German *trag-sitz* or bearing seat is an elaboration of this method.

2. A convenient litter may be constructed from two rifles with their gun-slings. To form this, the slings should be let out to their greatest length. That of one rifle should be unhooked from the ring near the muzzle; the sling of the other rifle should then be passed over this one; the unhooked sling should then be made fast again and passed over the other rifle. In the absence of gun-slings, the pieces may be connected by belts, straps, knapsacks, and other similar articles. The patient is to be seated upon the litter thus formed, leaning upon the rear bearer.

3. A hand litter may be constructed by taking two poles of suitable length and connecting them by coats, the sleeves of which are turned inside out and which are buttoned about the poles which are thrust through the sleeves. Three blouses used in this way form an excellent litter. The poles may also be connected by a blanket, tent fly or shelter tent fastened about them. They may also be connected by picket ropes, straps, belts,



Fig. 15.—Litter constructed of two poles thrust through the sleeves of three blouses.

The middle blouse is left open to show the disposition of the sleeves. The buttons are to be carried underneath.

etc., and when these are covered by a blanket or something of the kind, the result is a very comfortable litter.

III. *Where the patient is carried upon articles diverted to that use.*—In the execution of these procedures the maneuvers and commands prescribed for the hand-litter should be employed. This class may be divided into two groups, according to the attitude of the patient.

1. The patient may be carried between two bearers, seated upon a board, a rifle or carbine, or a chair.

2. The patient may be carried on a litter extemporized from a broad board, a door, a shutter, a cot, or other similar articles. The use of blankets, tent flies and the like to be carried by their four corners, is inconvenient for the bearer's and uncomfortable for the patient. It is difficult to conceive of a case where, in the absence of rigid poles or frames, such as are enumerated in this paper, it may be necessary to resort to the awkward blanket.

C. METHODS BY THREE OR MORE BEARERS.

It is not infrequently the case that the paraphernalia of litter bearing is deficient while there is an abundance of men for bearing. It is, moreover, not infrequently the case that patients are so injured, that in the absence of regularly constructed litters, the services of three or more bearers are necessary in order to carry them comfortably to any distance. If the distance over which the patient has to be borne is considerable, it is frequently desirable, in order to prevent fatigue, in the absence of a satisfactory litter, to divide the weight of the patient among several bearers.

- I. *By three bearers.*—In case of a wound of the lower extremities, where the patient is carried by two bearers according to the methods already described, a third bearer may be employed to support the injured limb.

- II. *By four bearers.*—1. The methods of carrying a patient in transferring him to or from a litter fall under this head—Nos. 1, 2 and 3, being the bearers proper, while No. 4 supports the head or the injured part—and they may be utilized for bearing a patient in the absence of a litter.

2. A litter may be constructed by forming the poles on either side by two rifles lashed together at the muzzle and connecting these poles by a blanket, tent fly, coats, or similar articles. The bearers being numbered as in hand-litter exercises, Nos. 3 and 4

grasp the poles in carrying at the point where the rifles are lashed, and thus support the weak point.

III. *By five bearers.*—A patient may be carried by five persons, one on either side supporting the head and shoulders, one on either side supporting the pelvis, and one supporting the legs. A greater number of bearers than five can not act conveniently.

CONCLUSION.

By proceeding with the discussion of the transportation of the wounded upon wheeled or other vehicles, the subject might be extended almost indefinitely, but I have purposely limited myself to that part of the subject concerned with carriage by human bearers, in the belief that less was known of this than of any other part, and that consequently such a study would be of particular value at the present time. It has been my aim to introduce nothing merely theoretical but to present what, after a careful winnowing of a large number of experiments, has been shown by practical experience to be the best. I trust that further investigation may still more perfect this fundamental portion of the management of the disabled, and that with a more prevalent knowledge of this subject the future may be brought into still greater contrast with the past.

The history of war has hitherto been a story of hundreds of lives lost by lead and steel, and of thousands of deaths due to sheer neglect. The broader humanity of our age is leading us to a higher conception of our duties to the fallen, whether comrade or adversary. The general of the future will not disregard the care of the injured in forming his plans for a coming battle, nor will it continue to be said that living men cannot be spared from dealing death, even to engage in saving life. Properly trained men will be found in every command whose duty it shall be to stay imminent death upon the field and, by means such as have been described, tenderly bear the wounded to points where surgical skill shall gather up the half-broken threads of life. The death-rate of future campaigns will be diminished, peace will be gained at a lower price, and the horrors of war will be vastly lessened—and in the attainment of this result the most important factor will be the proper *transportation of the disabled*.

THE ANTIQUITY OF MARINES AND THEIR RELATION TO THE NAVIES OF THE WORLD.

BY CAPTAIN RICHARD F. COLLUM,

U. S. MARINE CORPS.

INFANTRY, as part of the complement of vessels of War, was common to the Phœnicians, and to all the maritime States of Greece at least five centuries before the commencement of the Christian era. When vessels were no larger than open boats, pulling fifty oars up to the time of triremes, the warriors were the oarsmen. But as naval science progressed, and the size of vessels increased, there gradually sprang up distinct classes, which together made up the personnel of the Navies about 500 B. C. : the rowers, the seamen proper, who had the general management of the vessel and the sails, and the marines, or fighting-men.

Mariners are specially mentioned in the account of the battle of Lâdi, in the time of Darius, King of Persia, about 497 B. C. The Ionian Greeks being in a state of revolt, had their fleet drawn up at Lâdi, a small island off Miletas, where it was discovered by the Persians, "Of those who remained and fought," says Herodotus, "none were so rudely handled as the Chians." They had furnished to the common fleet over one hundred ships, having each of them forty armed citizens on board, and those picked men.

The same author, in estimating the Army of Xerxes to Greece, observes that each vessel had on board, besides native soldiers, thirty fighting men, who were either Persians, Medes, or Sacans.

At the dawning of the day of the battle of Salamis, the men-at-arms of the Greek fleet were assembled on shore and speeches

were made to them. These men-at-arms, or soldiers, which formed part of the complement of the Greek trireme, were called Epibatae, a word all authorities agree in rendering into English by the word *marines*. The largest members of marines found on board each of the "Swift Ships"—that is, the regular men-of-war, as distinguished from transports—at this period was forty. Plutarch gives the number on board each Greek trireme at the battle of Salamis as eighteen, four of whom were archers, and the rest heavy armed. During the Peloponnesian War, the average number on board the Athenian trireme was ten.

In the account of the battle of Platea there is an instance related where the military and naval training are curiously blended in the person of the Athenian Sôphanes. "He wore," says Herodotus, "an iron anchor, fastened to the belt which secured his breast-plate by a brazen chain; and this, when he came near the enemy, he threw out to the intent that when they made their charge, it might be impossible for him to be driven from his post. As soon as the enemy fled, his wont was to take up his anchor and join the pursuit."

When the Athenian Strategus Demosthenes was operating near Leucas with thirty ships, he landed his forces, and had, besides the Army, "the three hundred Epibatae from his own ships. Rawlinson, in translating the word Epibatae, explains that it means "the armed portion of the crew," corresponding to our (English) marines. Bœckh, a learned authority on the antiquities of Athens, remarks that "The crews of the swift triremes consisted of two descriptions of men: of the soldiers or marines appointed to defend the vessels, who were also called Epibatae, and of the sailors. These Epibatae were entirely distinct from the land soldiers, such as the *hoplitae*, *pelastae* and cavalry, and belonged to the vessel." They had, moreover, their own officers, called *trierarchoi*.

It is a fact not generally known that a corps of marines existed in the Roman Army, but it is nevertheless a fact; and also that a marine cohort was stationed in England. In Bruce's "History of the Roman Wall," which divided England from Scotland, the author states that, "In ascertaining the number and the names of the stations, a most valuable document has come down to our times from the period of the Roman occupation. The *Nolitia Imperii* was, probably, written about the end of the reign of Theodosius, the Younger, and was certainly com-

posed before the Romans abandoned the island. It is a sort of list of the several military and civil officers and magistrates, both in the Eastern and Western Empires, and the places where they were stationed. It may, in fact, be regarded as the Army List of the Roman Empire." The portion of the section containing the information I quote is headed, *Item per Lineam Valli*—"Along the Line of the Wall"—and after detailing seventeen cohorts, or wings of cohorts, with their stations, arrives at "The Tribune of the First Marine Cohort, styled Aelia, at Tunnocelum." Thus there was a first, and, therefore, a second, and possibly many other marine cohorts in the Roman Army.

During the naval supremacy of Rome, the quinquireme only, as a rule, was admitted into the line of battle. Polybius gives the number of rowers in these vessels as three hundred, and that of the Marines (*clasiarii milites*) as one hundred and twenty. In regard to the manner of fighting, it may be observed that the *Epi-batae* used arrows and darts at a distance, spears and swords in close combat, and as ships increased in size they added *balistæ* and *turres*, and fought from them as castles on land.

The true functions of the marine of modern times were little understood, his great value to the Navy to which he belonged little appreciated, till within a recent period.

The value of a well-organized Corps of Marines is recognized by all the leading governments of the present day. The marines of United Germany were selected from the élite of the Army, and that Corps equals the English in discipline and efficiency. Spain and Italy have also a well-disciplined force. The organization of the French Marines is considered the most important and efficient of the military forces. The duties of this Corps, however, are entirely confined to the protection of dock-yards and arsenals, and to the occupation of forts on the sea-coasts and garrisons in the colonies.

Until the year 1664, the British Navy was manned by means of the system of impress, or enlisting landsmen; but the commerce of England at that period was so limited that these measures were found inadequate to procure sufficient seamen for the public service, and this difficulty suggested the formation of Marines. The men were raised with the object of forming a nursery to man the fleet, and being quartered in or near the principal sea-ports, their great utility in the equipment of squadrons soon made it desirable to augment their strength. The first order

in council which has reference to this subject is dated the 16th of October 1664, authorizing 1200 soldiers to be raised and formed into one regiment. In 1740 three additional regiments were raised in America and assembled at New York. All the officers, excepting the captains of companies, who were colonists nominated by the provinces, were appointed by the Crown, and Colonel Spotiswood, of Virginia, was Colonel Commandant of the whole. Although the force has witnessed many changes in its system of organization, it has ever, by bravery and efficiency, proved the wisdom of the original plan for its formation.

It was a favorite remark with Nelson that "every fleet should have a perfect battalion of Marines, and, commanded by experienced officers, they would be prepared to make a serious impression on the enemy's coast. In all the contests in which Great Britain has engaged during the last centuries, by land and sea, the Marines have been distinguished.

From 1776 to 1784, the average strength of the Royal Marines amounted 18,790 officers and men. In 1844, the total strength amounted to 10,469. The aggregate strength at the present time is 15,000 non-commissioned officers, musicians and privates, divided into 16 companies of Artillery and 48 companies of Infantry. The officers are as follows;

GENERAL OFFICERS.

General, 1.	General Staff
Lieut. Generals, 2.	Deputy Adjt. General, 1.
Major " 5.	Quartermaster " 1.

LIGHT INFANTRY.

Staff.

Instructors of Gunnery, 3; Instructors of Musketry, 4; Adjutants, 7; Quartermaster, 7; Paymasters, 4; Barrack-masters, 4; Deputy Inspector General of hospitals, 1; Staff-surgeon, 1; Surgeons, 6.

Field and Line.

Cols. Comd't.,	3
Colonels,	5
Lt. Colonels,	12
Captains,	111
Lieutenants,	146

ARTILLERY.

Staff.

Staff Captain, 1; Instructors of Gunnery, 3; Instructor of Musketry, 1; Adjutant, 1; Military Instructor, 1; Quartermasters, 4; Barrack-master, 1; Paymaster, 1; Staff-surgeon, 1; Surgeons, 2.

Field and Line.

Col. Comd't., 1
Colonel, 1
Lt. Colonels, 3
Captains, 40
Lieutenants, 47

The military education of the officers of the Royal Marine Artillery is thorough. The Cadets are obliged to undergo a course of study for two years, during which, in connection with the ordinary course of instruction in the higher mathematics, they are expected to acquire a competent knowledge of all matters connected with the theory of projectiles as may have a practical application.

Trained as Marines are, for duty both on shipboard and on land, they combine the discipline of sea and shore in such a manner as to render their services indispensable in connection with the properly organized Navy of any country. Accustomed by the very nature of their training to the vicissitudes of sea and land, the value of their services cannot be easily estimated. *They are soldiers trained for service afloat.* Their discipline and equipment being that of a soldier, they necessarily give to a man-of-war its military character. Hence it may be assumed as a general proposition, subject to little qualification, that the value of a Marine Corps to a navy, or of a Marine Guard to a ship, is in direct proportion to the thoroughness of its military training, its *esprit de corps*, and the strict observance of that line of demarcation, on the part of the enlisted men, which separates the soldier from the sailor.

Although the organization of our own Corps of Marines, by resolution of Congress, bears the date of November 10, 1775; yet, as has been previously stated, the first American Marines date back to colonial times, viz., 1740.

The United States Marine Corps, although composed, comparatively, of a small force, has performed a most important part

in all the struggles through which the nation has passed. Acting as an integral part of the Navy, the Marines have won the highest praise from the naval officers themselves. It is not necessary, in proving the value of the services of the Marines, to bring forward credentials or testimonials to their valor or efficiency. Its officers and men have stood shoulder to shoulder with their gallant comrades of the Army and Navy, hence the glorious deeds of their brothers-in-arms have reflected additional lustre upon its motto.

"Semper Fidelis."

MOB AND MILITARY.

By LIEUT. RICHARD W. YOUNG, I.L.B.

[Continued from JOURNAL No. 33.]



PART TWO.—TACTICAL CONSIDERATIONS.

CHAPTER I.

PRELIMINARY MEASURES.

I. CAUSES AND ELEMENTS OF RIOTS.

IT is generally believed that the riots of the future are likely to be both more frequent and more formidable than those of the past. The growth of opinions concerning human liberty and of socialistic creeds, the perversion of the former, has been more rapid during the present century than during a large part of the earth's previous history. The struggle for freedom, on this Continent, culminated in the formation and adoption of a Constitution that has afforded exponents of human rights the opportunity to laud rather than to censure, and which, until the recent development of anarchism, was thought to be an almost perfect scheme of government, broad enough to secure to every man the privileges of life and liberty.

Anarchism is, therefore, not indigenous to the United States; its principles are the outgrowth of other conditions, its leaders are the scourings of foreign jails, its followers are largely criminals and idlers to whom any change would prove grateful, and its dupes are unnaturalized foreigners poisoned by the virus before they speak the language or understand in any degree the nature of the Government. The fact that in the United States the people are sovereign, the source of all power, and may change their institutions at will, demonstrates the sinister motives of the agitators.

If men are not to be ruled by their caprices and passions alone, if they are to be governed at all, as their social instincts and welfare demand, it would seem that they could frame no better government than that of the people of the United States.

But not so in Europe, where the failure of the Revolution to correct the manifold abuses of feudalism, and to effect the permanency of free institutions, was a bequeathment of agitation, much of which has been legitimate, to succeeding generations. The unquenched fires of opposition have continued to smoulder banked by repressive laws. The struggle for liberty has degenerated into fantastic and meretricious forms, and patriotism has

been transformed into anarchism. Yet anarchism and its kindred fallacies are of the most recent growth. Bakunin, who formulated Nihilism, and Turgeneff, who christened it, are our contemporaries. It is scarcely ten years since these opinions gained sufficient strength to break from the chrysalis of idea into an active and portentous existence.

Nihilism has assassinated its first monarch in Europe, and anarchism has thrown its first bomb in the streets of an American city. We have witnessed the birth of the heresy, and while we cannot foresee its destiny, we know that it menaces the existing order of things to an extent that demands serious attention. Riots, in the history of our country, have been the sporadic issue of local circumstances. They have been spontaneous and practically leaderless. There have been rent riots, as in New York State, in 1766, and again in the early part of this century; religious riots, as the Orange riots in New York in 1871-2, and the attack of the Ursuline Convent in 1824; bread riots, as in New York City in 1837; anti-liquor riots, as in Portland, Me., in 1855; political riots, as in Baltimore in 1812; election riots, abolition riots, and riots caused by the robbing of graves; and draft riots, waged by criminals against, what was thought to be, a defenseless city. But these disorders were purely local, being without instigation from other places, and without communication to them.

They were not the offspring of sober thought or a calculating mind, but the sudden outburst of passion soon satiated. The leader was not the coolest and wisest man among the mob, but the most angry and least discreet. Their weapon was the brickbat.

But all of this will be changed in any disturbance by the anarchist or socialist. Rioting may be said to be their profession. They will prepare for it by posing as the friend of the laborer, by widening the breach between capital and labor, and intensifying hatred between classes; by embittering the public against the militia and the police; by insidious attacks upon the honesty of public officers, and the purity of the bench; by selecting as the especial objects of their own threats or attacks prosecuting officers, and witnesses, and jurymen, who fearlessly perform their duties; by making a close study of the offensive and defensive possibilities of their neighborhoods; by getting possession of arms and ammunition, and delving into the secrets of the manufacture of explosives; and by drilling men in the use of these agencies. When they see fit to disrupt the peace they will not confine themselves to a single place, but their warfare will be as widespread as they choose to make it. Communication by rail and telegraph, the water and gas supply, will be cut off. Trained bodies of men, with fire-arms will defend barricades scientifically constructed, while the dynamite bomb will bring carnage to the troops, and the dynamite cartridge demolition to the building. The picture is not pleasant, but is it not truthful? Working in secret, the anarchist does many things we cannot ascertain, but that he will use dynamite has been sadly proven, and that he knows how to manufacture it may be seen by any one who will read the pamphlet of Herr Most, while that he possesses arms and exercises at drill are facts attested by frequent experience. It is fortunate that the manufacture and use of dynamite and other explosives are not secrets

known only to the anarchist ; if the latter uses them, he must not be surprised that they are used against him.

We turn now from a class of men who are professional rioters, to a far more numerous class whose object is the amelioration of their condition by peaceable and legal methods. Judged by their laudable objects, there would be no occasion to mention the vast labor organizations of the country in a work upon mobs and riots ; but, and herein these organizations are not exceptions to the rule of universal experience, good intentions are valuable only so far as they govern actions. If, therefore, we find in the history of labor organizations of recent growth, instances of open resistance to law, and particularly if we find such opposition to be the logical outcome of their systems, it will not be inappropriate to discuss them here. There are three immense gaps in the logic that would argue from the good intentions of labor unions to their good behavior. We must assume that their leaders will always be sufficiently statesmanlike and sufficiently free from demagogism to wield the power and resist the temptations of their high offices ; we must assume that their counsel will be implicitly followed ; and that in no conjuncture of circumstances, whatever, will they depart from their lawful resolutions.

But unwise and dishonest men will occasionally grasp the reins of power ; good advice will fall upon the deafened ears of a local assembly, whose interests are jeopardized ; and force will be resorted to to accomplish that which persuasion fails to bring about.

The labor unions of the day are tremendous engines, and let them but once be manipulated by unskillful or malicious hands, and the injury will not cease until every wheel in the great workshop is stopped, and misery is brought to the homes of many operatives. The means universally employed to accomplish the desired end, whether it be an increase of wages, fewer hours of work, or the restoration of a discharged brother, is, in the end, the "strike." To be successful, the strike must contain two elements ; all must cease work and none must be permitted to assume their places.

The right of a workingman to quit his employer at pleasure, unless governed by contract or in case of conspiracy, is unquestioned ; but the law will not countenance the forcing of the unwilling to cease labor, or the forcible prevention of others from taking the places vacated. And yet, without the application of force in both instances, it seems to be conceded by the laboring man himself, that the strike would be an egregious failure, and the future of labor organizations, unpromising.

The shameful lengths to which these societies have gone and have been permitted to go in some of our cities, in violation of law and in trampling upon the rights of others, suggests, disagreeable as the reflection is, that the arrogance of the laborer will bring him in conflict with the military. With the laborer in his efforts to better his condition by the exertion of moral force, every right-minded man in the community must sympathize ; but with him in his cruel, tyrannical and often brutal exertions of physical force, no man who appreciates the ease with which united workingmen can accomplish their ends by political and lawful means, can sympathize. In adopting the method of the anarchist, the workingman must assume the

responsibility of his active co-operation. The anarchist will seize every opportunity of spreading disorder; workingmen will do well to remember that their cause is essentially at variance with that of anarchism.

The workingman may suffer the evil effect of bad legislation, but he is devoted to the country and deeply concerned in the perpetuity of free institutions, and should, therefore, keep his organization as free from a leaven of anarchism, as his bread from a leaven of poison.

That workingmen have, as a rule, been the friends of order, and have generally appreciated their dependence upon existing laws and institutions in this Republic, is seen from the statement of Col. Otis, U. S. Army, that not fifteen per cent. of the railroad employés were participants or sympathizers with the mob, during the disturbances of 1877.*

General Beaver of the Pennsylvania National Guard, speaking of the Pittsburgh mob says, confirmatory of the foregoing opinion, that it was composed of roughs, tramps, unknown men, from where no one knew, and a few striking railroad men.†

Referring to the statement of Col. Otis, Gen. Molineux, National Guard of New York, a close student and accepted authority on the subject of riots, says:‡ "Supporting this assertion of Col. Otis, is the experience of the writer, who, during a close study of documents relating to these riots, and in search of military data, came across some interesting facts but little known to the general public. First, behind the strikers amidst their wildest recklessness and determination to force the roads into submission by preventing the running of trains, there was a *restraining power*, which prevented the wrecking of trains and much more extensive damage both to the roads and rolling stock. This is proven by numerous instances where the strikers had it in their power to destroy, with immunity, trains and vast amounts of other railroad property as well as the lives of passengers and troops, and yet allowed the opportunity to pass. Second, the same invisible power evidently appreciated the *value of public sentiment*, which, in the beginning, was with the strikers, and made every effort to retain this sentiment in their favor. This was seen in the *permission* for postal and occasional passenger trains, not carrying troops or ammunition, to pass on a clear track. Still stronger proof is furnished by the fact, that, when it might have been done with limited opposition, the depredations of Pittsburgh, Buffalo Creek, etc., were repeated only in isolated cases, and that the forbearance of the rioters was spontaneous and not due to outside pressure.

"Third, the opposition to the State troops was devoid of earnestness and vigor on the part of the rioters, whose neglect to inflict serious injury on their opponents was conspicuous from a military standpoint. The method savored of severe play rather than warfare, and was somewhat uncomplimentary to the troops. Can anything more cynically contemptuous be imagined than the mere soaping and greasing of the rails by the mob instead of tearing up the tracks for the purpose of ditching a train? And is not the fact that, in several instances, they merely uncoupled the locomotives

* JOUR. MIL. SER. INST'N, No. XIX., 293.

† Report Adj.-Gen., Pa., 1878.

‡ Ms. Paper in M. S. Inst'n.

and ran off with them, leaving the soldiers to enjoy the scenery in some lonely romantic point, another proof of the semi good-will with which they regarded them? Had they been enraged, violent men with the opportunities they had, the tale would have been far different and bloodier. Fourth, the respect, call it fear if you will, with which the U. S. uniform was regarded wherever it appeared. General Sherman in his report states, 'The National forces were able to execute all their orders without firing a gun. The single instance of serious resistance, it is believed, may have been in ignorance of the fact, that it was made against National troops.' General Hancock's report is to the same effect, 'Wherever the troops appeared they succeeded by their presence alone in repressing the disorders, although they had frequently to bear in patience and silence a great deal of abuse and some personal violence.'"

The same authority quotes the Secretary of the Brotherhood of Locomotive Engineers, to the effect that, "As an organization we had nothing to do with them (riots of 1877), either directly or indirectly, beyond exercising a restraining influence to prevent our members from becoming mixed up in it. In that respect we were successful in so far that, while in some instances individual members were concerned, yet as lodges, there was not an instance where our organization was concerned in it."

Strikers at Syracuse were detailed to guard the property of the company, and in Ohio troops were fed by them. These facts should not be without their lesson both to the striker and to the soldier; they should teach the lawless element among the workingmen that in their aggressions they will have neither the support nor the sympathy of their fellows, and should teach the soldier that the composition of the mob facing him is eighty-five per cent "roughs, tramps, and unknown men," anarchists and thieves, and fifteen per cent. laboring men without the support of the great bulk of their brethren in their unlawful acts and attitude.

In addition to these disturbing elements, may be mentioned others that cannot fail to exert a powerful influence for evil. Such are the increase of population, often too rapid for assimilation, and the unprecedented multiplication and growth of corporations, controlling and affecting the fortunes of the bulk of the population in an arbitrary way.

Such, too, are certain defects or abuses of our system of Government, by means of which men, whose sole qualification is wealth or demagogism, are elected to important offices, in which, by reason of incompetency or venality, they bring the law into disrepute. The effects of bad laws and the corrupt administration of law are pernicious in the extreme, bringing not only oppression to the individual, but doing much to shatter the foundations of the Government.

It seems certain, therefore, that the shirking of political duties by the best citizens, and their relegation to those who interest themselves solely through sordid motives, is suicidal. When men deeply interested in the success of the Government and in the stability of order, refuse to concern themselves in the nomination of good men, or to become candidates themselves, fail to vote, and seek exemption from jury service, leaving the

conduct of affairs largely to professional politicians and their "heelers" they must look for civil disorder, where otherwise they might expect peace.

Such citizens should enroll themselves with the military, so that in times of disturbance, they may wield an effective arm in support of that peace and good order, and those institutions, they prize. It has been said that the wealthy man should divest himself of the idea that he hires the soldier; that he should not be content simply to ride "into protection on the high conception that the soldier holds of the sacredness of property and peace." *

In reading the history of riots, one is struck by the frequency of the statement that the cause of the riotous outbreak has been the recklessness of the press; and it needs but little thought to reach the conclusion that an irresponsible demagogue at the head of an irresponsible newspaper may easily enkindle the passions of the riotously inclined, and fan them into flames. A sympathy for men who wilfully trample on the law to accomplish their ends is false and dangerous, and this is so whether the ends sought are just or unjust.

It is false because it will desert its objects when they perform the acts it encouraged them to perform: it is dangerous because it spurs on the lawless and leads to violence and bloodshed.

General Pearson, of the Pennsylvania National Guard, reported from Pittsburgh during the troubles of 1877:

"On the morning of Saturday (21st), I was astonished to find that public sentiment was in much accord and sympathy with the strikers; if not openly supporting their course, yet, by its quiescing and non-condemnation of their unlawful acts, certainly affording a popular encouragement that tended to support the evil-disposed in all that had then been done by them in their interference with the rightful prosecution of the business of a great railway." * * * "This sympathy and feeling were backed and supported by the almost unanimous endorsement of the newspapers of the city, which with but one or two exceptions, I believe, by their references and comments, either discouraged the action of the State authorities to protect property and restore order, or so far countenanced those who were obstructing travel as to warrant them, with their passions inflamed as they were, in assuming that the law-abiding citizens believed that the course pursued by them to right their grievances was just and proper. Whether the sentiment against the railway was righteous or not, the prominence given it by press and people, when the right to enjoy property for lawful trade and traffic had been actually stopped, had much to do with the terrible disasters of the 21st and 22d of July. Nor were the people aroused to the full consequences of their sympathetic tendencies until the appalling destruction of property and its attendant financial liabilities awakened them to the real situation."

Not only do the public foolishly encourage men on to the taking of human life and the loss of their own by sympathetic words, but they often abet them by their presence. Some one mentions that, in the days of

* JOURNAL MIL. SER. INST'N. XVI, 369.

Van Twiller and Stuyvesant, it was the custom of the good housewives of New Amsterdam to retreat into their houses at the first indication of a street disturbance, and to close their shutters and bar their doors. They were not, it seems, preyed upon by that morbid curiosity which impels the average citizen, male and female, of our day, to join a crowd.

This is always unwise, but in time of civil disorder, it is simply criminal; for the men who, through mere curiosity, stand around to see what is going on, are apt to be mistaken both by the rioters and the military or police, as active participants. The rioter sees a great multitude behind him, and he attempts felonies which he would not dream of were the crowd composed of his fellows alone. The military is confronted by a vast multitude seemingly acting in concert, the situation appears to be serious, and volleys of musketry are poured into the opposing crowd. And thus it happens that so many mere spectators have fallen; we may say justly fallen, since, by both law and reason, the man who lends to the rioter the moral effect of his presence, must be viewed as an accessory.

"Mind your own business," should be the fashionable rule in time of riot. The person who reads the history of riots cannot fail to learn what a large part is played by boys in lawless acts, which suggests the improper exercise of parental authority.

Of the twenty-three persons killed in the Astor Place riot, at least seven were under twenty; while we read of arson and robbery by other boys, at other times, during times of civil disturbance.

It has been stated that "It was proved that the rioters had more respect (in 1877) for one Federal bayonet, than for a whole company of militia."* This statement, though exaggerated, is not without some foundation, in fact. The fact cannot be disguised, and is universally admitted, that there are certain reasons why militia are inferior to regulars in civil disturbances; the militiaman is but occasionally a soldier, and that habit of obedience, that familiarity with the duties and hardships of the military profession which characterize one, are impossible to the other; and again, that absence of personal sympathy which comes from the isolation and the frequent changes of the regulars, is impossible to militia called into service in their own districts.

Militia regiments are by no means uniform in point of drill and discipline, being graded between the limits of satisfactory efficiency and complete inefficiency. There are militia regiments, indeed, that in drill and preparation for riot duty are superior to any regiment of regulars in the Service. This comes from the facts that regulars have been widely scattered and engaged in Indian and other duty, while many militia regiments are componently united, and devote much attention to the study of riots because they realize the duties required of them.

The sympathy of militia for rioters is to be obviated by the employment of State troops in localities distant from their armories. The effect of this sympathy and the beneficial results attending the removal of Philadelphia troops to Pittsburgh are made manifest in the report of the Adjutant-General of Pennsylvania for 1878. It is there stated that General Pearson

* *Nation*, No. 632, Aug., 1877.

commanding at Pittsburgh, reported that on July 20th, there had reported to him of the 14th Regiment, not a man; of the 19th, but fifty; of the 18th, but 150 and the battery; that he feared that "the majority of the troops sympathized with the strikers." It is also stated in that report that troops willing to obey in the morning, were, by contact with the mob, rendered insubordinate before evening; that the Philadelphia troops were reliable, but were, with few exceptions, deserted by the others; that home troops could move through the mob without attack. It is such occurrences as these, happily not frequent, that lead to the opinion that one Federal bayonet is worth a company of militia, and to the further opinion as expressed in the following:*

"The consequence is that many of the horrors and aggravations of mob-rising come from the unsteadiness of militia. Killing by militia is apt to rouse a thirst for vengeance, like the killing in a street fight, while a volley from regulars has the terrors of legal execution. Of course there are militia regiments that are exceptions to this rule, and several during the late troubles have rendered inestimable service; but they are not to be relied on for serious emergencies, such as we trust every sensible man now sees, are among the contingencies of American life."

II. CIVIL AND MILITARY.

When the military is to be called out, who is to call it out, and the relations between civil and military officers have been discussed in the first part of this paper. The occasions when it may be called into action are prescribed by statute in nearly every State in the Union. Before such a step is taken it is not necessary to exhaust every resource of the civil power; when, within the discretion of the officer to whom this privilege appertains, the danger is sufficiently widespread, or the resistance sufficiently severe, the right is to be resorted to. In the Massachusetts Regulations, which appear to be fully abreast of the times, and to be unusually wise in their provisions and clear in their language—a model, in fact, for other States seeking rules for the government of their military—are the following instructions:

It is to be observed that the militia may be called out only at the instance of the civil authorities, who are to judge of the necessity of the measure; and whose precepts are to receive the absolute obedience of the military officers called upon. The civil officer, being responsible to his Government, is not required to communicate to the military officer his reasons for asking for the troops, although such manifestations of confidence are to be desired; he is only required to state distinctly the duty to be performed and such other information as may be necessary to enable the officer in command efficiently to perform the service required.

The civil officer is therefore the judge of the necessity. The provisions of law in the same State, which will be different in other States, and should be carefully studied by every militiaman, as to who may exercise this power, are as follows:

In case of invasion, or insurrection, actual or threatened, the Commander-in-Chief shall call upon the militia; or in case of a sudden emer-

* *Nation*, No. 631, Aug., 1877.

gency, when that officer cannot be informed and his orders received and executed, this authority is intrusted to the brigade commander.

In case of riot, actual or threatened, brought to the attention of the Commander-in-Chief, the sheriff, the mayor, or selectmen, the former may issue an order, and either of the latter a precept, directed to any commander of a brigade, regiment, battalion, corps of cadets, or company, directing him to appear with his command at a time and place designated. This precept must be in writing, under seal, signed and attested as the act of the civil officer issuing it, and may be varied to suit the circumstances; and a copy shall be forwarded to the Commander-in-Chief.

The officers to whom the order or precept is directed shall forthwith parade the troops at the time and place appointed, armed, equipped, and supplied with ammunition, and shall notify the Commander-in-Chief direct in the most expeditious manner, and also by letter through the usual military channels. A refusal to obey such order or precept is made an offense punishable by court-martial.

When the volunteer militia does not furnish sufficient force, the enrolled militia is to be called upon: the former being the active force, the latter the body of citizens liable to be called out in certain cases of emergency.

As to the relative authority of the civil magistrates and the military officer after the troops are called into service, these regulations express the general rule of the common law, in providing that, "While the instructions of the civil officer are given in *general terms* to accomplish a particular purpose, the mode and means are within the discretion of the military commander." A further provision is commendable, that if, after a lawful call, no instructions are given by the civil officer, or there be a conflict between civil officers making the call; or if the instructions given are contradictory, inconsistent, or unlawful—the military commander will, the occasion requiring it, use the troops so as to secure peace and the due observance of law, agreeably to the call made upon him.

III. PREPARATORY AND PRECAUTIONARY MEASURES.

"In time of Peace prepare for War" is an injunction quite as valuable in a local as in a national sense. Accepting the fact that danger lies within our borders as well as without, it is quite as necessary that plans be considered for the prevention or suppression of riots as that steel guns and torpedoes be prepared for the defense of harbors. In a letter from an Assistant Adjutant-General of the Militia of Massachusetts, to the Secretary of the Military Service Institution, are found the following invaluable points:

"Gen. Wales has nearly completed his plan of preparation against riots in this city.

"His first step was to assign each of his staff to a certain district, with orders to examine it thoroughly and report in writing. These reports comprise descriptions of the streets, buildings, character of the inhabitants, means of barricading or other resistance by a mob, points of advantage, quickest and least exposed avenues of approach, with suggestions as to the best disposition of troops, whether acting offensively or merely as a probative force. Each report was read and discussed at a staff meeting, and sub-

sequently, at a time appointed, the district covered by that report was perambulated by the General and the entire staff for the purpose of confirming, revising, or adding to the observations and suggestions of the author of the report. In this manner all the important points in Boston have been minutely studied, first by a single officer, selected with reference to his special familiarity with the locality; next by Gen. Wales and full staff.

"The result is that each officer at these headquarters is perfectly familiar with certain sections and entirely ignorant of none.

"During the progress of this work, Gen. Wales purchased one of the great insurance atlases of Boston, and located upon it conspicuously all armories, police stations, engine-houses, etc.—this in addition, I presume you understand, to the map marks and colors indicating height and material of buildings, whether flat or pitched roof, with or without openings in party walls, and other peculiarities of construction, location, and size of water mains, hydrants, etc. Under special directions from the General, Capt. Field, A. D. C. (a signal officer during the War) has established signal stations at various points, to man which he has a picked corps under diligent instruction.

"The question of getting troops from outside into the city, in case of serious trouble, has been carefully considered by the General, who has devised a plan for debarking all reinforcements where they can be free from molestation from the mob.

"Our northern railroads enter the city in a section teeming with the mob element, and troops arriving there would have their *morale* dangerously tried. To avoid this, means have been adopted to switch trains around the city to points where the debarkation and formation of troops can be accomplished safely and speedily. Particular care has been taken to select advantageous points for the debarkation of artillery.

"The legal question was one of the first to be discussed, and by direction of the General, Captain Parker, Judge Advocate, prepared a paper presenting a digest of the State law and decisions.

"The information acquired by our four months study we have endeavored to preserve in the plainest and most accessible form. The reports of the staff have been copied with a type-writer, and the copies, after being carefully read and signed by the authors, placed in a file and indexed, with references to the maps in the insurance atlas.

"We thus have a spare copy of each report, which might be of great value to an officer suddenly placed in command of a district covered by the report. Very much of the information thus gained is committed to the atlas, including ranges from all important buildings to all points commanded by them, the manner of opening and direction of the swing of the various bridge-draws, the points at which gas and water can be shut off, etc." Similar preparations were made in Brooklyn as early as 1879.

If it should happen that mobs were to arise and the laws to be defied, it would be fortunate for the city that such thorough information had been sought and systematically preserved. Such steps should excite the emulation of all general officers who may be called upon to defend a city from the depredations of a mob. Parades and dress-ceremonies are usually re-

garded as the end of Militia instruction rather than as a means to the far more important end of preparation for effective service in time of danger. Cadence and the manual have usurped the place of practical instruction. Principles have succumbed to showy details. It is said that the precautions taken at the time of the London Chartist demonstrations in 1848 were admirable, and quite worthy the reputation and ability of their planner, the Duke of Wellington. 170,000 special constables were sworn in, among other measures. Various precautions will suggest themselves to the thoughtful civil officer and to the careful business man. We read, for instance, in the accounts of nearly all riots, that among the earliest demonstrations of the mob were attacks upon gun-stores and gun-factories. This suggests that these stores should be guarded, and the names of buyers recorded; or it would, perhaps, be more satisfactory, if practicable, to declare by law or ordinance that gun-stores should be permitted only in the immediate vicinity of police stations, where they could be effectually guarded. In case of apprehended danger at time of election, the number of polling places could be indefinitely multiplied. When possible, meetings which it appears would terminate as unlawful assemblies, should be forbidden.

The press should act in accordance with the great responsibility upon it, and should be careful not to publish anything that might be construed into a justification of mob violence. Armories should be defensible, both in site and architecture, and should not be so constructed, like many costly armories in some of our leading cities, that it would be impossible to defend them from a half-energetic mob.

Gas-works and mains, water-works and mains, should be guarded, and public buildings and private houses should not be without facilities for lighting and for procuring water in case of the shutting-off of the water and gas supply.

Signalling should be practised, a cipher adopted, and means devised for rapid communication with other armories, headquarters or police stations.

At the inception of trouble, all liquor saloons should be closed.

Railroad companies would do well to construct, at the head of their bridges, simple earth or masonry epaulements, which might enable a small force to defend successfully a costly structure from the attacks of a mob; this is the more important as the destruction of bridges is the favorite method of preventing communication by rail.

IV. ASSEMBLY AND MOVEMENT.

The undress uniform should be worn, and the overcoat should always be taken. The latter rolled tightly lengthwise, cape extended, may be tied together by the ends, over the left shoulder and under the right arm, the knot to the right and rear.

The knapsack is to be worn beyond the limits of the troops' own town; haversacks and canteens are quite necessary. Rubber blankets should be taken by all who have them. Clothing should be adapted to the season, and great care should be exercised that excessive loads may not be put upon the soldier.

Ammunition, with reserve supplies, should be issued to the men under the immediate supervision of company commanders.

"Under no circumstances will blank cartridges be issued to troops who are to aid the civil power," are the instructions of the Massachusetts regulations, embodying, it is believed, the experience of all military men who have been engaged in riot warfare.

To provide for the certain and rapid assembly of troops at their armories it is necessary that a system be adopted.

The striking of bells possesses the disadvantage of notifying the mobber as well as the militiamen, and is therefore not to be approved. The regulations of several of the States make it the duty of the captain to divide his company into squads, each under charge of a non-commissioned officer, who is at all times to carry with him a list of his squad and their addresses, the squads being so arranged that there will be no loss of time in warning them. Cards of notification are to be issued to these non-commissioned officers.

Soldiers are directed to conceal their identity in traveling to their armories, with the two-fold object of preventing being waylaid, and of suppressing the mob by an unexpected appearance in force. "Experience shows that disturbances of the peace are most likely to occur in the summer months," and for that reason, since soldiers are most widely separated then, changes of address should be promptly communicated. The necessity of having everything in readiness at the armory for instant service is manifest.

Difficulty may often be experienced in emerging from the armory, particularly from an upper story. The difficulty may often be avoided by making a feint down the staircase or out of the door, which should be protected by a sufficient guard behind a barricade, while the main body pass out from some other door or through an adjoining building, or over the roof. Orderlies, if used, should be in civilian garb; they should pass in and out of the building by other ways than the regular entrances, and should be able to make themselves known by previous arrangement, and thus be passed upon their errand.

Gen. Wm. H. Brownell, N. G. S. N. Y., is the author of a practical and deservedly popular work on riot tactics, which, it is believed, is accepted as a manual by New York troops. The following is an epitome of those tactics so far as movements preliminary to actual fighting are concerned:

The regiment should be equalized into an even number of companies, bayonets fixed.

Before leaving the armory details of marksmen will be made, at least four to each company; who shall march, in column of fours, just outside of the line of file-closers, and, in line, in rear of the file-closers.

If egress from the armory is rendered difficult by the presence of a crowd, the following method is suggested: The first and last divisions will be formed in the armory, close together in parallel lines, both divisions facing in the direction of the line of march, the last immediately in rear of the first; both divisions will then be faced towards the door of exit, the captains and file-closers will take places between the two columns, which

will then be moved out and across the street to the opposite buildings; proper commands will then be given to march both divisions by the flank; the first with its front rank in front, and the last, with its rear rank in front, will march in opposite directions, clearing the entire street before them, until the first division has gained sufficient ground to allow each of the divisions remaining in the armory company distance; the last division halts at company distance. The other divisions march out by fours and take their proper places. The details of this movement may be varied as circumstances suggest; the leading idea being to move two divisions, or, it may be, companies from the building, in the manner described, to clear space for the formation of the column.

Flanked column order is a hollow square, formed as follows:

Being in column of divisions, the colonel commands:

1. *Flanked column order*; 2. MARCH.

At the first command, the chief of the first division commands:

1. *First division*; 2. *Stand fast*.

Chief of the fifth division: 1. *Forward*; 2. *Guide right*.

Captains of remaining odd-numbered companies: 1. *Right forward, fours right*.

Captains of remaining even-numbered companies: 1. *Left forward, fours left*.

The command march is repeated, and by closing up, the square is completed; all officers, file-closers, colors, signalmen, etc., will take place in the interior.

Sharpshooters march in the line of file-closers. The *flanked column order* may be narrowed and widened to suit the width of the street. The narrow column order will be found more suitable where, in passing through quiet districts, it is not desired to drive people from the sidewalks. The narrow column is formed from the wide column by breaking fours from the first and last divisions, to the rear and front respectively, and by obliquing the flank companies to conform. Upon halting, the rear division will be faced to the rear; and should circumstances demand it, the flank companies will be wheeled into line facing outward.

The *flanked column order* may be formed from column of companies, as follows: The colonel commands: 1. *Flanked column order*; 2. *Form first and fifth (or fourth, if only eight companies) divisions*; 3. MARCH.

Captains give preliminary commands to oblique the first and ninth companies to the right, the second and tenth to the left; to move other odd-numbered companies, right forward, fours right; and other even-numbered companies, left forward, fours left.

The command march will be repeated; the first company obliques until its left is at the center of the street, then advances company distance and is halted; all other companies conform.

When the armory faces a large open space, the *flanked column order* may be formed as follows:

First company, in column of files (double rank), right in front; second company, on left of first, in column of files (double rank), left in front; both march out in parallel columns; the first executes column right, the

second, column left; each marches its length, line is formed by the left and right flanks respectively, thus forming the first division, which is moved forward. Meanwhile, the odd-numbered companies are formed in column of fours, right in front; and the even-numbered companies with left in front. The two columns of fours are moved out to their proper places in rear of the flanks of the first division. The last division is formed from the ninth and tenth companies, by executing left and right front into line respectively. In changing direction in flank column care must be taken to shorten step at the pivot.

The provisions of the Massachusetts regulations touching the movement of troops through a town, where crowds have congregated, but there is no open resistance of the authorities, are as follows:

2329. Officers, moving troops through a town, under orders to preserve the peace, should provide themselves with accurate maps, or guides, or both, unless they are personally acquainted with the locality.

2330. From the infinite variety of possible situations, it is impossible to prescribe, definitely, the tactical formation to be assumed by troops in marching through towns where a disturbance is threatened. As a rule, the hollow square will probably be found best adapted, the front and rear of the square should extend from building to building (not from curb to curb), so that the sidewalks may be occupied by the columns of fours forming the sides; the street being occupied to the exclusion of all other persons who must not be permitted to pass the column, but be compelled to seek another route or wait in side streets until the square has passed.

The commanding officer judges as to the manner of forming the square; he designates the strength of each front and the officers to have charge; the color-guard and a reserve should remain within the square; the front and rear should have small reserves to increase the width when the streets demand. Upon halting, the rear should be faced-about, and the columns of fours at the sides wheeled into line facing outward. File-closers march on the inside flanks. The field, staff, musicians and ambulance are within the square in positions assigned them.

2332. A double column of fours will be found well adapted as a preparatory movement to the formation of a square.

2333. As a rule music will not be played; in a word the movement should attract the least possible attention.

2334. A squad of police should accompany each body of troops to make necessary arrests. They may march inside the squares when necessary, and can dart out of the cover of the column, strike right and left, seize a few of the leaders, and drag them back as prisoners with more celerity than soldiers encumbered with rifles.

In this manner a mob may be broken up without the necessity of firing.

2335. Commanding officers should be mounted; this will enable them to see over the heads of those around them. A door or shutter raised upon the shoulders of a number of sturdy soldiers, would afford a point of observation, where a horse cannot be obtained.

2336. Persons must not be allowed to intermingle with the troops, or close upon them so as to interfere with their maneuvers, nor to become so

entangled with them that it may be possible to disarm them; nor must a riotous assemblage be advanced into by a flank movement.

2337. A sidewalk is a place of vantage, and where a small body of troops is advancing along a wide street, should be occupied in preference to the center of the street.

A sidewalk is more elevated than the street, and is protected on one flank. Under no circumstances should a crowd be permitted to occupy them to threaten the flanks of troops and precipitate a conflict.

V. INCIPIENT STAGES.

Soldiers must not think that the quelling of riots is an easy matter. It is true that there is little of the heroic in contending against a ragged mob armed with paving-stones; that it is far less satisfactory to be crushed to earth in the shadow of a tenement by a brickbat hurled from no one knows where, than to fall wounded upon some battlefield, destined to become historic. But after all there is no more vitally important duty than the suppression of a lawlessness that threatens the stability of our institutions and the safety of our homes. The problem is quite as difficult as it is important, being one of the hardest tasks that falls to the lot of the soldier.

The uncertainty shrouding the numerical strength of the enemy, his preparation and whereabouts, and above all, the nature of the seat of strife where each house may be turned into a fortress, that must be assaulted in the face of a desperate resistance—are difficulties seldom encountered together upon the battlefield. The brilliant genius and wonderful energy of Napoleon were nowhere more apparent than in his early triumphs on the streets of Paris; and the Duke of Wellington displayed that same calculating mind at the time of the Chartist demonstrations that he did at Waterloo.

Lord Mansfield's saying that, "It is humanity to check the infancy of tumults," is confirmed by universal experience. The anxiety to avoid bloodshed is natural and proper; it should never be shed unnecessarily, but, on the other hand, the time comes in the history of every serious riot, when the sacrifice of a life will prevent the loss of numerous lives. At that moment there should be no hesitation, no indications of timidity; all false sympathy should cease, and the offenders be looked upon, not as American citizens, but as felons and murderers.

The fact that the soldier can foresee the event of the contest, and may be certain that not one-fifth of the lawless element confronting him have any claims to being honest workingmen, should render agreeable an otherwise disagreeable duty. Mobs are, from their constituent elements, peculiarly liable to dejection or elation; they sink into their hiding-places or swarm into the streets directly as they fail or succeed. Without discipline they can neither be checked in the excesses that follow a victory, nor rallied from the discouragement that follows defeat.

Victorious, or temporized with, the mobber finds a thousand venal wretches at his back; beaten, or energetically handled, he is deserted by his whilom friends. The fact that there are in society so many professional agitators, so many anarchists, socialists, thieves and cut-throats, who, with

the instinct of the vulture, will seek the field of prey, or with the instinct of the rat, desert the sinking ship, renders it absolutely necessary that the mob shall not be trifled with to the extent even of permitting them to seem to be victorious for a single day. This is essential not only as a rule of temporary advantage, but invaluable for the lessons it teaches. The rioter whom a false delicacy and a mistaken sympathy have dealt leniently with, will acquire a taste for the business, which he would scarcely have retained had he received his deserts.

Gen. Fitz John Porter, in the *North American Review*, October, 1885, writes :

"Mobs are cowards at first. * * * They only gain courage as they find that those whose duty it is to suppress them are themselves cowards. A mob is not to be feared when it is first aroused. It is only as its passion for carnage is whetted by the taste of blood, or its greed for pillage is gratified, that it becomes dangerous. Upon whomsoever devolves the duty of suppression, let this be his first effort : check at the very beginning ; allow no tumultuous gatherings ; permit no delay ; a few stern, resolute words ; if these be not heeded, then strike resolutely, boldly ; let there be no hesitation ; if necessary, take life at the outset. It will be more merciful to take one life than to suffer the mob to take the lives of many, or to be compelled to sacrifice the innocent with the guilty at the point of the bayonet, or in the discharge of musketry or cannon."

Gen. Molineux * says that an effective show of force should be made at the outset ; the mob should be taught that their plans are foreseen and their measures should be forestalled ; that every minute of time is valuable. "Promptness," he says, "rapidity of movement, iron decision, crushing power exercised relentlessly and without hesitation is really the merciful, as it is the necessary course to be pursued."

The author of "Great Riots,"† writes ; "The order to lay down their arms and disperse, if disobeyed, must be followed by such decisive action that no doubt can remain of what the issue will be. If mobs knew that the first salutation after the order to disperse was given would be grape-shot and canister, we should see the end of them."

The same writer states that he knows of no instance where it paid to harangue a mob ; that promising legal satisfaction to law-breakers is a very unsatisfactory proceeding. "Obedience first and discussion after being the proper order to be observed."

Gen. R. M. Brinton in the Report of the Adj.-Gen., of Pa., for 1878, says : "But our strict obedience to orders was mistaken by the mob for cowardice, and our silence, under their insults, and firing of pistols and throwing of stones, encouraged them in that belief until it had grown so strong that, flushed with apparent victory, it led to the results that followed." * * * "Had I been allowed to clear the streets at that time, I believe the riots would have been ended."

In the Draft Riots of 1863, in New York City, there was an occurrence, of which there have been other instances in nearly every serious riot before

* JOUR. MIL. SER. INST'N XVI, 340.

† P. 347.

or since, of the folly of delaying energetic measures. A company of regulars on service there was marching through one of the streets, and encountered a riotous throng; the mob began to throw rocks; the military made no response; the mob became more daring, and finally, as a question of self-defense, the captain ordered a volley to be poured into his assailants. Action had been too long delayed, and as a result, numbers of people, and among them the innocent, were writhing in agony, where a single shot aimed at the miscreant who precipitated the assault might have ended the conflict.

Such considerations have led to the wise instruction in the Massachusetts regulations that: "Any man in a crowd, on a roof, or at a window, plainly seen to fire a shot, throw a stone, or assault a soldier, should be shot, not by an indiscriminate volley, but by a marksman firing by order at that man."

In the Astor Place riot the sheriff gave the order to fire. The soldiers fired over the heads of the crowd, and a shout came from the mob: "They have only blank cartridges; give it to them again!" The attack was renewed with increased energy, and the troops were forced to do their utmost in self-defense; as a result, twenty-three persons were killed and a large number wounded.

The regulations just referred to provide that "Firing with blank cartridges is prohibited, experience having shown the evil result of such fire in the first instance;" that "The only eventually merciful measures are the severe ones." Gen. Bolton, in the Report of the Adj.-Gen., Pa., 1878 (p. 74), says: "No shooting in the air, no blanks, but the pure lead, well-directed, and plenty of it, regardless of grand or other juries. Riots mean war, the wounding of men, agony and death." There is complete unanimity among military writers as to the folly of using blank cartridges. In certain riots in Bristol, in the first half of the century, Col. Brereton, in command, dealt gently with the offenders, and thus precipitated affairs, so that a riot which might easily have been suppressed by an early use of force eventually terminated in the loss of over one hundred lives. Col. Brereton, who was about to be court-martialed for acting in a "Feeble and temporizing manner, calculated to encourage the mobbers," shot himself.

There is one consideration which must have great weight with an officer who may be called upon to fire into a mob, and this is the undoubted presence of many innocent people. It may be said that if rioters are handled in the future as they deserve, it will not be so fashionable for idle and curious men, women and children to stand around where there is apt to be firing.

This predicament has but one escape—a brief, intelligible notice to the crowd to disperse to their homes or occupations, or to take the consequences. After this there should be no hesitation in firing, the occasion demanding it; otherwise, it were better the troops remained at home.

The energy displayed must be so effective, the victory must belong so obviously to the military, that there shall be no room for the reflection that if the time had only been better chosen, or the leaders more competent, or themselves better armed, the result would have been different.

The evolution of the rioter from the thrower of the brickbat to the hurler of the dynamite bomb, suggests the necessity of keeping rioters at a distance. It also suggests that the anarchist must be met with his own agencies; if he expects to use dynamite, he must look for it to be used against him; if he may hope to use it effectually, having to manufacture it and use it secretly, the troops, who may obtain it in unlimited quantities, put up by the most scientific methods, should not fear the contest.

Concerning riots in their incipient stages, the remarks of Gen. Beaver* are apropos.

"At every point where citizens organized and armed for self-defense, the mob element was successfully held in check, and, in my opinion, furnishes the only remedy for formidable outbreaks, such as that of July 22 and 23. Whenever the outbreak becomes general * * * well-disposed citizens must *visibly* exhibit their sympathy on the side of the enforcement of law and order, and stand in organized form by the side of the uniformed Militia of the Commonwealth."

Gen. Christiansen, N. G. of New York, mentioned at a meeting of the U. S. Military Service Institution, that in Brooklyn, in 1863, companies of civilians constantly patrolled the streets armed with clubs or canes, etc., and prevented any large gathering of rioters.

* A. G. Pa.'s Report, 1878, p. 9.

CHAPTER II.

CONTACT WITH THE MOB.

I. STREET FIGHTING PROPER.

THE following epitome and extracts of certain sections of the Massachusetts Regulations, though occupying considerable space, are of such a character, it is thought, as to justify their insertion.

2338. Military officers, acting in aid of civil authorities, will themselves retain the command of the troops, and enforce the most exact discipline. Coolness and self-possession will be enjoined; also the necessity that no man will fire without orders from his proper military superior.

2339. Commanding officers may cause the troops to arrest all rioters and other persons in open resistance to the civil authorities, and are empowered and required to overcome such resistance, and secure and keep the peace by the use, if necessary, of their arms and all the power they possess; but they are not authorized to punish any person for an offense, however amenable he may be to punishment, and they will always endeavor, by a firm and judicious conduct and the moral force of their presence, to establish the public order, if possible, without a resort to arms; to have accomplished this result will be the best evidence of their skill and the excellence of their measures.

2340. The following method of procedure is to be followed in dispersing a tumult or riotous assemblage: on approaching the place the military officer in command will request the civil officer to give notice in a loud voice, requiring the assemblage to disperse; unless this notice is given by the civil officer it will be given by the military officer.

After waiting for a suitable time to allow the mob or rioters to disperse, the troops will advance and attempt to clear the place, or disperse the rioters, obtaining, if possible, the active aid of the civil force, and especially the personal presence and authority of the magistracy. If the troops shall then be attacked or resisted, so as to be unable otherwise, to clear the ground, or disperse the rioters, they may fire, or use any other means necessary to attain the end designed; but in no case will they fire without the orders of their proper military commander.

2341. The order to fire, must be given by the superior military officer, in command, on the spot, who is to examine the scene of disorder, and then, in view of all the circumstances, exercise a sound discretion as to the force demanded. "His honest and reasonable judgment in a case of apparent necessity, is all that is required by the law; and his lawful command will be a sufficient protection to all who are subject to his orders."

2342. By the laws of the land, homicide, or the taking of human life, is justifiable, when necessarily committed, by public officers, and those acting under their command, in their aid and assistance, in overcoming resistance to the execution of legal process, or to the discharge of any other legal duty; and it is also justifiable when necessarily committed by any person in attempting by lawful ways and means, to apprehend any person for any felony committed, or in lawfully suppressing any riot, or in lawfully keeping and preserving the peace.

2343. It will be an axiom for the guidance of military commanders acting in aid of the civil authorities to use no unnecessary violence, but to employ as much force, and of such a kind, as will suffice to accomplish the object for which their services have been required.

2344. While it is the rule of law that all persons giving countenance to a riot by their presence are principals, particularly after notice to disperse, yet it is to be remembered that many innocent spectators or idlers are usually present, and that, for this reason, notice should be given before proceeding to extremities; in firing, pains should be taken that the fire be made effective only against those actually engaged.

2345. Commanding officers should explain that in the event of the troops being ordered to fire, their fire will be effective.

2346. Firing with blank cartridges is prohibited, experience having shown the evil results of such fire in the first instance. "The only eventually merciful measures are the severe ones."

2347. The firing will cease, whether ordered by the magistrate or not, the instant it is no longer necessary. Persons separated from the crowd, unless seen to be aggressors or instigators of riotous acts, will not be fired upon.

2348.* To protect the least daring, or the innocent, troops must be instructed to aim not higher than the waist; or, if at very short range, not above the feet.

2349. Although the first fire should be as effective as possible, it is of paramount importance that it should be possible to check a sudden onslaught by a renewal of the firing. The fire by rank (rear rank commencing) will probably be found safest and most efficacious against a mob not barricaded and at close quarters; at longer range, or against a barricade, file-firing will probably be found to be the best, as admitting more careful aim.

2350. The troops are authorized to defend from attack their persons, their arms, and any place, street, or building in which they may be stationed.

* Gen. Molineux states that the penetration of the ordinary cartridge is too great, thus endangering women and children, and adds that experiments with multiple balls have demonstrated their adaptation to street-fighting.

In case of any sudden onset on the troops, or any place, street, building occupied by them, or other urgent circumstances requiring instant attack or resistance, the notice and other measures preliminary to the action of the troops may be dispensed with. The order to fire in this case will be given by the military commander on the spot. But it is not for every slight attack that the troops will be ordered to fire. There must appear to be a necessity for so doing, and that other less dangerous measures will not suffice to secure the safety of the troops.

2351. The casting of missiles, or the firing of shots, is not to be considered as a slight attack. Nothing so emboldens a crowd as passive resistance, and it should never be allowed. The first stone or shot thrown or fired at the troops should draw two or three shots, fired under order, by marksmen designated, great care being taken that no firing is done by any other man than the man or men specifically designated therefor. Any man in a crowd, on a roof, or at a window, plainly seen to fire a shot, throw a stone, or assault a soldier, should be shot, not by an indiscriminate volley, but by a marksman firing by order at that man, more caution being of course observed if the man to be shot is in the crowd than at a window, on a roof, or at some other place where he can be seen apart from other people.

2352. The appearance of a military force does more to awe a crowd than its physical power; therefore, a crowd must not be engaged with too small a force; the main body of troops must not be too much weakened by detachments.

2353. Cavalry is only serviceable against a mob where a charge is to be made; this should be done at a brisk trot or gallop. Broken ground renders cavalry useless. Cavalry must be supported, or provision made for its return.

2355. When other means fail, artillery is most effectual for clearing streets. When moving to their position, guns should be masked by infantry or cavalry. Can shot, canister and grape, by reason of their shorter range and greater execution, will be used in preference to round shot.

2356. Gatling guns should be posted with infantry in hollow square, and masked by divisions which extend across a street, and fires through an interval formed by breaking one or two fours to the rear. The fire of the troops may be transferred to the windows and house-tops, when the Gatling gun is in use. Gatlings should be so mounted as to be easily dragged by soldiers without the aid of horses.

2357. If hydrants are numerous and handy, a fire-engine and a few lengths of hose, with a coal wagon, inside a square of troops, would be found useful in dispersing a crowd.

2358. Troops should be carefully instructed in bugle signals on account of the difficulty of understanding commands in a noisy crowd. Where this may not be done thoroughly, the bugle should only be used for the "commence firing" and the "cease firing," and the troops made to understand that no firing is to take place without the bugle signal, except where marksmen are individually ordered. This will prevent unauthorized shooting, panic or accident.

While the men may be assured that they will not be made targets of, without the opportunity of resenting, they must be made to understand that the commanding officer alone is the proper judge of how and when they may defend themselves by firing.

2359. In street-firing, orders must be explicit as to what part of the troops are to fire, and the whole command must understand to what portion the order to fire appertains, and every man who fires is expected to make his bullet tell.

2360. Streets, in their nature defiles, are easily defended by barricade, and from the house-tops and windows. The square is a valuable formation, since, while the front sweeps the street, the sides command the houses on the opposite sides.

At times, however, it may be necessary to occupy the houses, to drive out or capture the inmates; the struggle will occur at the first house attacked, that taken, the roof, if suitable, may be used, or openings made from house to house, always in the uppermost stories. This will prevent loss and perhaps demoralization.

2361. Barricades, if they can be flanked or reduced by a plunging fire, should never be attempted by brute force. Artillery should be promptly used to batter them down.

2362. A very strong door can be blown down by ten pounds of powder.

The tactics of Gen. Brownell, which, so far as preliminary movements are concerned, have been previously described, contain several movements providing for actual contact with the mob. The following is a summary of the latter:

"The *street-riot order* is simply a column of divisions formed from the flanked order column, or column of fours or companies; the command to form divisions being prefixed by '*street-riot order*.'"

This order differs from the usual column of divisions in that the file-closers of the last division are in front of the division, that the interior divisions break to the rear the left set of fours of the right companies, to afford communication, and that the sharp-shooters are arranged at equal intervals along the flanks of the column, except those of the two companies of the rear division, who march with their file-closers.

Distances may be increased at pleasure.

In case of resistance to the first division, the others, while kept at hand for relief or support, may be placed under any available cover.

The column may be moved in either direction, by facing.

If the fronts do not cover sidewalks, they may be widened by rear-rank men on each flank; or in a very wide avenue by men from the interior divisions.

In driving a mob along a street many of the rioters will take refuge in the intersecting streets, and, being on the flank of the column, will prove dangerous unless prevented from doing mischief. Upon approaching the intersecting street the command is given: 1. *1st and 2d divisions*; 2. *Arms*; 3. *PORT*. Having executed this command, the second division, if the mob is aggressive, will be moved rapidly up to within a few yards of the first (the rear four in line and file-closers and officers in rear).

As the street is reached the command is given: 1. *1st division*; 2. *Companies right and left turn*; 3. *MARCH*.

The companies are halted just inside of the line of building, and promptly widened with rear-rank men, if necessary. Sharpshooters of the turned companies will seek for secure positions where they can see the mob cut off.

The first division must not approach the turning points until the second division is close at hand.

The column is still advancing, with the 2d division in lead. As the rear of the column passes, the companies of the 1st division are faced to the left and right, execute column left and right, and form as the rear division. officers and file-closes in front.

If the mob be violent, the rear division of the main column may be halted and faced about to cover the formation of the flank companies, which will form between the one halted and the main column.

This maneuver will be repeated, when necessary, at every street-corner; and also, to preserve the integrity of the division, at those corners where the streets meet, but do not intersect.

The same system may be followed in relieving a leading division.

Interior divisions may be moved back out of range of missiles thrown at the first division.

In changing direction to the right, the right company of the leading division moves straight ahead and halts within the building line; the left company *turns* to the left and guards the intersecting street from that flank; the other divisions change direction under the protection of the first division, which forms as the last division, by facing to the right, changing direction to the right, and moving by the left flank.

The flank column order, or tactics prescribed by Upton for field-work, will be found useful in going through a square or park.

The foregoing movement may be executed by platoons and companies.

Street riot order requires only three companies or divisions; this will enable the detaching of part of the force to flank barricades, march in parallel streets, etc.

The lieutenant-colonel and major will each be provided with a non-commissioned staff-officer to report anything of importance.

The usual manner of directing the dressing of a company, etc., must be omitted in the face of an angry mob.

Sharpshooters should be generally supervised by an Inspector of Rifle Practice, detailed for the purpose.

Sharpshooters must be constantly on the alert, watch the roofs and windows on the opposite side, and, at a halt, seize any prominence affording them a view of the mob. They must not fire until individually ordered, unless under special or general instructions to the contrary. During a general engagement they may be instructed to pick off any who are noticed as assailants. The knowledge that trained marksmen are present, specially instructed to shoot the leading spirits among the aggressors, would have a salutary effect.

Artillery, if employed, will be placed between the 1st and 2d, and 3d and 4th divisions.

To prepare for using the guns, sufficient fours will be moved to the rear to give room for the guns to be run up on the line of the remaining fours; the latter protecting the guns, and firing, if deemed necessary.

The following is a part of the regulations and orders of the British Army regarding the suppression of riots :*

5. The officer commanding the troops is to move to the place to which he shall be directed by the magistrate; he is to take care that the troops march in regular military order, with the usual precautions; and that they are not scattered, detached, or posted in a situation in which they may not be able to act in their own defense.

6. The magistrate is to accompany the troops, and the officer is to remain near him.

7. All commands to the troops are to be given by the officer.

8. The troops are not, on any account, to fire, excepting by word of command of their officer; and the officer is not to give the word of command to fire unless distinctly required to do so by the magistrate.

9. When the number of the detachment shall be under twenty files it is to be told off into four sections.

10. If there should be more than twenty files, the detachment is to be told off in more sections than four.

11. The officer commanding is to exercise a humane discretion respecting the extent of the line of fire.

12. If he should be of opinion that a slight effort would be sufficient to attain the object, he is to give the word of command to one or two specified files to fire. If a greater effort should be required, he is to give the word of command to one of the sections, told off as above ordered, to fire; the fire of the other section being kept in reserve till necessary, and, when required, the fire of each of them, being given by the regular word of command of the commanding officer.

13. If there should be more officers than one with the detachment, and it should be necessary that more sections than one should fire at a time, the commanding officer is to fix upon and clearly indicate to the troops what officer is to order any number of the sections to fire; such officer is to receive his directions from the commanding officer, after the latter shall have received the requisition of the magistrate to fire. No other individual, excepting the one indicated by the commanding officer, is to give orders to any file or section to fire.

14. The firing is to cease the instant it is no longer necessary, whether the magistrate may order the cessation or not.

15. Care is to be taken not to fire upon persons separated from the crowd.

16. It is to be observed that to fire over the heads of a crowd engaged in an illegal pursuit would have the effect of favoring the most daring and the guilty, and might have the effect of sacrificing the less daring, and even the innocent.

* Hough's Precedents, 360.

17. If firing should unfortunately be necessary, and should be ordered by the magistrate, officers and soldiers must feel that they have a serious duty to perform; and they must perform it with coolness and steadiness, and in such a manner as they may be able to discontinue their fire at the instant at which it shall be found that there is no longer occasion for it."

Cavalry, infantry and artillery are all useful at certain stages, and in certain localities, during time of riot. Cavalry, mounted and dismounted, will be found useful, in extended riots, for service in the open country, along lines of railroad, etc.; and also in the streets of a city at the earlier stages, where, by backing the horses or urging them forward, an unarmed mob may be dispersed. This has been done in English and French riots, and is, indeed, a method resorted to by the police in clearing the streets for public processions.

Artillery will be found indispensable in the attack of barricades, the dispersion of the more bloodthirsty crowds, and in the shelling of houses used as strongholds. The lighter ordinary Gatling guns, the Improved Gatling, the howitzer, and the Hotchkiss revolving cannon, may be easily handled without horses, and will be found useful each in its field. When thrown to the front for use, the guns and cannoneers should be shielded by some extemporized means—rolls of carpet, barrels filled with rocks, etc.

Infantry, in riot warfare, perhaps to a greater degree than elsewhere, will be called upon to bear the brunt of the fighting.

Before attacking, the number and position of the rioters should be ascertained; this applies particularly to those cases where the law-breakers have turned a certain district of a city into an intrenched camp by means of erecting barricades and occupying buildings. A hap-hazard attack without first acquiring this information, while it might not lead to defeat, might materially lessen the extent of the advantage gained. Troops should be in sufficient strength, and, in more serious outbreaks, an eye should be kept upon the communications. As to acquiring information concerning the strength and disposition of the mob, the occasion seems to be particularly favorable to the use of detectives or spies. The lack of discipline which characterizes and must ever characterize the mob, renders the use of such agents a simple matter. It would seem, therefore, that a wise commander should be constantly posted as to the movements and intentions of his adversary.

Night fighting should be avoided, since it is impossible, in narrow streets of a city, to preserve discipline and to secure a concerted attack; there is also great danger of ambuscade. On the other hand, preparations should be made against a night attack, and a strict guard kept, particularly just before day-break. It is to be said, however, as suggested by General Molineux, that the streets are clear at night, and the rioters apt to be in a demoralized condition, through drunkenness or bad discipline. The provisioning of troops stationed in a city, or in a section of a city likely to be beleaguered, is of the utmost importance, and will receive the attention of the careful commander. Troops should always take rations if sent any distance.

Ammunition, likewise, should be provided in sufficient quantities—

which, it has often happened, has not been done—and should not be wasted.

In a movement along the streets, in the face of opposition, it is a general rule that the troops are not to be crowded, as a repulse of those in front might lead to terrible slaughter and confusion. The advance should be made by successive companies or platoons at considerable intervals, those not actually engaged being kept as much as possible under cover. There should always be advance and flanking parties and a rear guard. Skirmishers should be advanced and instructed to slip along the walks, and thus protect themselves by projections from the buildings.

The flanking parties should be in force and march in streets parallel to the street of main attack. This will result in out-flanking the crowd, and will lessen the casualties from a heavy column proceeding along a single street. The effect of order and discipline will be especially great in the attack of bodies liable to sudden panic. A line of retreat must be looked to. The leading sub-division of troops need not be retired and replaced unless it is necessary and the occasion permits it; it may be replenished from succeeding companies. The formation, says General Molineux, should be in single rank.

The military, being weak, may occupy a house not commanded, or, also, the commanding houses. It being impossible to communicate with headquarters or other troops by signaling, messages may be sent to them through a disguised man with a concealed note. The importance of seizing at once the central telephone offices is apparent—these might prove to be the best places for establishing headquarters, since it is likely that, despite wire-cutting by the mob, many wires would remain uncut and communication open to divers parts of the city. A cipher or other system of identification would be imperative under these circumstances. Well-disposed persons are to be protected, and it would be well if arrangements were made by means of which the military, acting in concert with the police, could secure and imprison disorderly persons, during the continuance of trouble, at least. The dead and wounded should be removed immediately. Stretchers with the troops and ambulances in the rear, out of danger, under the direction of an organized hospital corps, in case communications were open; or, if not, ambulances in front of the rear company of the column, or the use of the houses of friends, would afford the means of doing this.

Captain Putnam, in the riots of 1863, told the women of a house from which missiles had been shot or thrown, that upon a recurrence of such an attack he would open upon the house with artillery; and the inmates of houses were ordered to shut their windows.

II. BARRICADES.

Barricades in the streets of a city may be constructed of almost anything that may be at hand. Among the many materials suggested, are the following: plankings filled with earth, dung, stones, bales of cotton or wool, fastened down with stakes, fascines, hurdles, etc.; or of wagons and carriages, their wheels removed, filled with earth, etc.; or of palisades and stockades, iron chains, etc.; or of alternate layers of paving-stones and

earth, with the steep face turned toward the enemy, and with ditch and pits or abattis; barrels and bales of merchandise, casks filled with stones, counters, trees, boxes, signs, telegraph poles and wires, the best way of removing which would be by securing a purchase from a convenient building, and by raising the heads of the poles to the vertical; rolls of carpet and matting are excellent, and are usually at hand; sacks filled with earth, etc., etc.

In the construction of barricades, the rules governing the construction of field fortifications should govern. It should be located, 1st, at elevated points so as to command the street in front, and 2d, at the middle of a block because at the end they would be more easily turned. The buildings at the flanks should be loopholed and garrisoned. In case of apprehended attempt to prevent the assembling of troops at their armories, barricades may be constructed to keep back the mob from the main entrances, while ingress is found in another way. It may be here stated that in case it is found impossible to defend any armory or other building containing guns or small arms, or in case it is feared that such building is insufficiently guarded, measures are to be taken to render these arms useless.

The prompt defense of gun stores, and a constant effort to prevent arms or ammunition from falling into the hands of the mob, will reduce the number of casualties, and shorten the strife.

Authorities agree that the direct attack of barricades is, as a rule, unwise. Great loss of life, and probably defeat, will result, with a consequent disheartening of the troops and elation of the mobbers.

The danger of repulse will be particularly great, where the neighboring houses, as well as the barricade, become points of vantage.

It may be possible to out-general the rioters and cause them to abandon their barricades by the construction of counter defenses and the stationing of troops at all approaches to them, a method, perhaps, always practicable, on account of the impossibility of the mob's barricading all the numerous avenues by which any district of a city is to be approached. Water communication and the use of armed steamers will be found useful for this as well as other purposes in time of riot.

If, however, the barricade must be attacked, a bird's-eye view of the mobber's position, and a careful reconnoitre of his surroundings, are essential preliminaries. By such means, commanding houses may be discovered and occupied, and courts or passages found that will permit flank attacks. Artillery should be used to breach the barricade, and shells, by means of the Hotchkiss or other gun, poured behind it. A plunging fire from sharpshooters on commanding buildings, redoubled at the moment of attack to prevent the defense of the crest, should be used.

In an extremity a mine may be run under the barricade. The possibility of surprising mobbers behind a barricade due to lack of discipline and to poor guard duty, is worthy the constant attention of a commanding officer operating against an intrenched mob.

III. ATTACK AND DEFENSE OF HOUSES.

There are many public and private buildings that, in times of riot, it

will be necessary to defend at all hazards. Public officials and managing officers in charge of these important buildings should devote some study to the problem of their successful defense from a mob. As buildings differ from each other in design, construction and location, so will the problems of defense vary. The plan in general will include not only the defense of the building proper, but the defense of such neighboring structures and streets as, undefended, would render the task more serious and less hopeful. A few inexpensive alterations or additions, the piling of material in the basement, and, at the first sign of trouble, the laying-in of hard bread and canned goods, would go a long way in preparing for a danger that is far from improbable. A few severe riots would impress the fact upon the builders of banks and public edifices that the riot, as well as the conflagration, is a contingency of the future. What is really singular is the fact that most of the armories that have been built in our great cities are almost entirely without adequate means of defense. Instead of being fortresses, they are warehouses.

The new armory of the 12th Regiment, in New York City, is a notable exception to this criticism, and is capable of an easy defense from the most violent attacks of a mob. In the defense of public buildings, employes will be found very effective if supported by a small number of troops; this plan has the advantage of freeing the military for service in the field, where irregulars would be entirely useless.

Where an advancing column is fired upon from a house, the house should be forced and the mobbers driven therefrom.

Small bodies of troops should be detached from the main column to enter the building.

This may be done by the front, by the back, by the side, and by the roof. The back of a house will be apt to be unguarded; and to enter from the top, either from the roof or through the party-wall of the top-story, will possess the advantage of catching the occupants unaware, and of enabling the attacking party to fight down rather than up. There should be great hesitation in making a direct attack upon a house thought to be barricaded. It should be shelled; and it has been stated, by competent authority, that there are few modern houses, however barricaded, that could long withstand the fire of the Hotchkiss revolving cannon, with shells loaded with ordinary black powder. In the absence of this weapon, any artillery that may be at hand will be efficacious. The Gatling gun, used against the doors and windows, will do much to silence opposition. If the mobbers do not occupy houses on both sides of the streets, small parties may move along close to the side occupied, and, under cover of sharpshooters' fire on the windows, may batter or blow down the door, and thus afford an entrance to the troops. Sharpshooters, under the same conditions, should occupy the opposite houses, front and rear, and pick off every offender who is seen to fire.

In the absence of artillery, or in the event of its being impossible to employ it, or where the rioters have occupied both sides of the street, it will be necessary to avoid a direct attack on the outside of the building. Detachments should enter the nearest available house in the same block

with the barricaded house, and should work their way from building to building. Inasmuch as such work is always probable, troops should never be without axes, crowbars, rope, sledge-hammers, short ladders, and bags of powder, containing from six to ten pounds, for breaking through strong and well-barred doors. Hand-grenades, either specially furnished or extemporized from tin cans and bottles, wrapped in cloth and loaded with dynamite or powder, and containing tacks, nails, etc., will be indispensable in the attack and defense of buildings and barricades; they will be useful dropped down chimney or ventilating flues. Houses to the front, at the back, or at the flanks of the house attacked, may be occupied at the same time that the attacking party is breaking through from floor to floor, which will not only enable riflemen to assist the attack, but may enable them to silence the front fire, and thus permit an attack from the street. If properly managed, it is the opinion of Gen. Molineux, a house occupied by mobbers may be made a veritable trap for them. The probability of such measures suggests the importance of having trained engineer officers and troops with the column. As soon as a house is broken into, the assailants should follow the defenders closely from room to room, or story to story, so as to prevent a new defense behind other barricaded and loopholed defenses; and all who do not at once cease resistance should be shot, and the house cleared without delay.

In the defense of important buildings the following suggestions will be found useful:

All openings to the street, except those in use, should be substantially barricaded.

Doors and windows in use should have musket-proof doors, commanded if possible, from other parts of the building, interior or exterior. All windows near the ground should have strong iron gratings and shutters. Other doors and windows should be blocked up with bags, bed-sacks, or pillow-cases filled with earth, carpet in rolls, books, or, if a severe attack is anticipated, or the buildings be of more than ordinary importance, with double beams loopholed.

Loopholes are to be small, and those of the lower story, and those for interior defense should be so high that the enemy cannot close them or fire through them—in this case a banquette is made within of planking or any convenient material. The loophole should be about four feet from the floor or banquette. For purposes of observation and easier defense, there should be loopholes at the flanking angles. A constant fire may be kept up through a single loophole by several men, who fire and retire in succession.

Balconies and other projections may be transformed into machicoulis for the defense of the entrances where there is no flanking fire. They would be useful also where the lower floor had been captured or the flanking-fire silenced.

Ample communications from part to part should be provided, without, however, sacrificing the possibility of interior defense, if such defense were contemplated. This will be necessary in the case of the defense of masses of buildings.

An interior defense may be made from room to room by providing openings in rear with musket-proof doors, loopholed, and by loopholing the walls; between one floor and another by cutting down the stairs and depending upon ladders, by loopholing the floors, and taking paving-stones, logs of wood and other missiles to the upper stories. Hand-grenades of regular manufacture or extemporized as previously explained, will be found particularly useful in the defense of a house. At Saragossa, in 1808-9, the Spanish preparations embraced the successive defense of houses so that every line penetrated gave the French possession of a small part of the town only, leaving them similar difficulties in front, and, when possible, continued occupation on their flanks.

The roofs are important both for defense and offense, and as lines of communication, and, in the preparations for defense, should receive the attention of the officer in command.

Parapet walls, a blockhouse, or a covered way to permit escape or communication with protection from the fire of a commanding building may be found necessary. Care should be taken that the enemy is not permitted to make his attack from the roof.

Commanding houses should be occupied, or mobbers should be dislodged, or cover be improvised to reduce the danger. The building defended should be insulated as much as possible from adjoining structures; if this be found impossible, the probability of an attack through the party-walls of the adjoining house be contemplated, and preparations made at once to forestall it, either by loopholing the party-walls, or preparing an interior defense through partition walls.

Houses commanding streets, squares, or open ground, which the enemy may use, should be occupied and loopholed, and preparations made for the withdrawal of detachments to the main structure.

Trees and fences, if inconvenient, are to be cut down, and houses demolished, if the importance of the defense justifies it.

Communication through the premises in rear must be provided—for support, retreat, messengers, supplies, etc.

Water, biscuit, and salt beef, should be provided where a long siege is anticipated; water, bread and fresh beef for a short one.

Precautions against fire are to be taken. Buckets and tubs of water should be provided. The reserve force should have charge of the suppression of fires, and this should be thoroughly understood, so that the defense might not be abandoned.

A hasty defense should be made, in general from an upper story, with floors loopholed and stairs-cases barricaded with chairs and tables. A closed blind or curtain enables the defender to take a rapid shot and retire without being seen, and veils the movements of those inside from the attacking party. The construction of traverses across the street flanked by the houses, or the digging of a ditch around the house may, in a serious affair, be found expedient. When the possession of a room is disputed the defense may make loopholes opposite those of the assailant, the room to be filled with smoke, and soldiers, under cover of the smoke, be sent to strike up the points of the muskets, and block up, use, or throw grenades through the opposing loopholes.

CHAPTER III.

MISCELLANEOUS SUGGESTIONS.

IN addition to the excellent means described by the Massachusetts regulations of calling the militia together, it might be well to arrange a system of signals by means of bells or flags at railroad stations or ferries, etc.

In the incipient stages of riot, and among crowds felt to be friendly, a fire-engine may be found to be efficacious. "The bubble reputation," it has been said, "is not sought at the nozzle of a hose-pipe;" the drenched rioter is not an object of sympathy. But it seems that the use of such means against an ugly mob would have the effect of arousing passions which the hose could not subdue; it would cause the rioter to feel that he was trifled with, and not being frightened or injured would lead him to avenge the insult. The battering-rams, ladders and axes, found on hose-carts, might be found useful.

In case of protracted riots pervading an entire city, or part of a city, supplies may be cut off from the part affected.

The men of a command should be studied; the presence of artisans, telegraph operators, interpreters, riot-sympathizers, etc., may thus be ascertained.

In the Draft Riots of 1863, armed steamers patrolling the river fronts saved the docks; a brilliant light, reflected from the *Times* office, was largely instrumental in keeping off the mob. This latter fact suggests the importance of using calcium or electric lights, not only for the purpose indicated, but by the defenders of buildings and barricades, for the prevention of surprise. Detectives mingling with the mob during those riots, learned of the contemplated destruction of Mayor Opdyke's house, gave timely warning, and thus enabled the house to be saved.

The importance of drilling troops in the firings, of teaching them to recover at the command, of insisting that no man shall fire without hearing the command because his next file has fired, are primal. It is written that in a comparatively recent riot in the United States, one gun went off without orders, and was followed by a volley that cost 31 lives and 67 wounded.

Military commanders and the police in time of riot have often been compelled to act in a summary manner, scarcely contemplated by civil rules of peace. In 1863, Capt. Putnam informed a hack-driver that if he

failed to come when he was ordered to come, he would be instantly shot; and Superintendent Acton put a driver in a cell, who refused to take a number of police to the scene of trouble; he broke in the doors of an empty house, whose owner refused its use to the city's defenders; and provisions were obtained from a neighboring grocery, with or without leave. In Pennsylvania, in 1877, 34 civilians, who fired into a mob, were arrested on a charge of murder, as the result of an inquest held by mobbers on the killing of three ringleaders, but were taken from the mobbers by Gen. Huidekoper, and held for genuine legal proceedings.

The importance of defending armories should lead to careful study of the possibilities of defense.

It has often been thought wise for the moral effect in insurrections that the troops should not be the assailants; but whatever rule may be thought to obtain in such cases, there is a consensus of opinion that, in case of riot proper, indecision is often fatal, and lenity is looked upon as timidity.

The discordant elements of the Republic must be taught that it is a serious matter to resist the laws; to do this and to prevent the augmentation of their ranks, it is necessary to strike early and hard.

Courage and decision must characterize commanding officers. Common-sense above all things, a non-rigid adherence to tactics, and an ability to take advantage of circumstances, are needful. Men must not be needlessly exposed.

CHAPTER IV.

MOVEMENT OF TROOPS BY RAIL.

I. MARCH TO THE STATION.

IF large numbers are to be conveyed, great care is necessary in selecting routes of travel for the several columns, and in preparing time-tables, so that the troops may reach the point of embarkation at the appointed hour.

The instructions of the Massachusetts regulations for the march to the station, embarkation, journey and debarkation, which are as full and explicit as usual, are as follows:

1912. The approaches to the station must be kept clear and silence strictly enforced when the troops arrive near them. Discipline to be strictly enforced, whilst marching through a town to a railroad, upon their arrival there, and whilst embarking.

1913. Only troops for whom the cars are intended should enter the station—spectators and friends are to be excluded.

1914. If the station is occupied or threatened by the mob, the commanding officer will clear and guard a space at some point above or below, and move the train within his lines of guards.

II. EMBARKATION.

1915. Military units are to be kept together, and, as far as possible, fully equipped, having their wagons, etc., with them, so as to march off without delay.

1916. Great care must be taken to prevent crowding and blocking of troops at the end of their journey.

1917. Cars should be marked with the number of soldiers they are to carry, and the regiment (and company) from which they are to be filled.

1918. Infantry should take off their knapsacks and shift their cartridge-boxes, haversacks, bayonets and canteens, round to the front of their bodies before entering the cars.

1919. Arms must not be laid upon the floor; they may be placed on the knapsacks under the seat, if allowed by the commanding officer. As a general rule, each man should retain possession of his rifle.

1921. Supplies should, if possible, be despatched in wagons or carts, loaded for transportation at the end of the railroad journey.

1922. The strictest silence should be maintained in the ranks until the train has departed.

1923. A brief halt near the station should be made to prevent the necessity of men falling out of ranks at the station.

1924. Once in the cars men, not on fatigue or other duty outside, should be kept there.

Enlisted men of cavalry will be divided into sections, according to the capacity of the cars for the horses—the sections numbered from right to left. The sections will file off and halt in front of their proper cars as previously numbered. A quiet horse should be selected to go in first; a restive horse may be backed in. The horses' heads should be turned away from doors, as they may be easily frightened by passing trains. Each horse must be securely tied, and an inspection by non-commissioned officers and detailed men should be made to see that the fastenings are secure. The men are to remember the number and position of the car containing their horses. Horses should be packed as closely as possible, and be kept without hay or straw.

In long journeys with artillery the harness is to be removed from the horses and carefully and systematically marked and placed in a baggage-car. The guns and carriages are carried on open cars, the pieces are unlimbered, the trails resting on the car floor; the limbers are lashed to the carriages, and the wheels chocked by pieces of wood nailed to the floor. Projections beyond the sides or ends of a car must be avoided.

III. THE JOURNEY.

1935. The time-table should be arranged with a low average of speed; this applies particularly to those cases where a number of trains are required to move the troops.

1936. Sentinels should be posted before starting at each end of each car to prevent men from passing from one to another, and unauthorized persons from entering.

1937. Every two or three hours there should be a short halt, and every eight or nine hours a halt of at least an hour, for feeding men and horses. Time-tables should provide for these halts and the points selected, so as to secure a good supply of water.

1938. The arrangements necessary for feeding a great body of troops are considerable, and much depends upon them; hot coffee or tea is especially necessary.

1939-40. Time is necessary to water horses in cars; officers in charge will see that it is perfectly done.

1941. Each car will be under an officer specially assigned; company officers will remain with their companies.

1943. Police duties at halting-places must be carried out. No intoxicating liquor should be allowed in or near the trains.

1944. An extra engine with staff-officer should run ahead, in cases where interference with the track is feared. A telegraph operator with portable instrument and wire, and a detachment of workmen with twenty or thirty rails, should be on the leading train. Skids should be provided for use in disembarking horses and artillery at any point.

IV. DISEMBARKATION.

The main body of infantry should be marched clear of the station and halted on the nearest available open space, a fatigue party being left to assist the drivers in unloading. No straggling is to be permitted on any pretense. Officers will get out of the cars first; then the men, at the proper command, will get out and fall in at a designated place. If a crowd threatens, a clear spot not too far removed will be selected, a guard established, and the men disembarked.

V. MISCELLANEOUS.

The following suggestions to officers on railroad duty, are, in substance the work of Major General Molineux, N. G., S. N. Y.* Such additional points as have come to the attention of the writer are added.

1. See that your men have blankets and overcoats of their own, if not furnished by the State; also, extra socks.

Lieutenant Greene in his "Russian Campaigns in Turkey" states that certain organizations in the Russian Army use cloths in strips wound around the foot and ankle, instead of stockings—in the absence of the latter, this suggestion might prove useful.

2. Cultivate a cheerful feeling. Be prompt, just, exact, brave, cheerful—these will influence the men.

3. Study the disposition, character and habits of your men, and particularly their occupations—it may be useful. Encourage the witty man, it will maintain cheerfulness.

4. Provide your command with rations—you do not know where you will sleep.

5. Use discretion in embarking and debarking troops. Avoid crowds. Get the railroad people to mislead as to the place. In embarking, pull the train out a mile or two, and march the troops there by an unusual route. If the troops are at the depot, put a guard on the train, and march the command alongside until a convenient spot is reached—this is particularly necessary if mobbers are turbulent or hostile. In case of contact, innocent people would be apt to suffer at the depot, but are not so apt to be present a mile or so away. So, debark at a distance from the depot, and if necessary to go to the depot, march alongside the train prepared. The officer in command should be the first to debark and the last to embark.

Troops in trains must never be embarked or debarked in the presence of a hostile crowd, nor in the presence of any crowd. Trains stopped at way-stations must be in such a position that an assault can be promptly checked. Post guards on either side of the train in any case. It may be possible to run around dangerous points and mobs on other lines, as mentioned in A. Gen's Report, Pa. (1878, page 88.)

6. Run a pilot-engine, if possible, under guard, in front to remove obstacles. Have a working party to clear obstructions placed on a baggage or flat car, with a guard having orders to form line or deploy until troops may be disembarked in case of attack.

Aside from comfort, platform, freight and baggage-cars are the safest—

* MS. in Library of MIL. SERV. INST'S.

the latter two have no windows, are lower, and men may be put on top, if necessary. In the absence of a pilot-engine, in approaching a dangerous point, stop the train, and let the engine and tender, with skirmishers, advance to the dangerous point. If all is safe, the engine may return for the train, leaving skirmishers.

Gen. Molineux mentions a train in the Civil War made up as follows: Engine, with a platform on the cow-catcher, with six men of keen vision; a car of hay and oats, to act as a buffer in case of derailment; then the troops in cars, the commanding officer in the front car, the second in command in the rear car, every man with his own command, with orders to stay there and permit no man to leave, two men on top of each car, strapped down to prevent falling.

Gen. Brinton's train in Pennsylvania, in 1877, was composed of an open car ahead of the engine, with Gatling gun and thirty sharpshooters, then two engines, then troops in cars, then another open car with Gatling gun and thirty sharpshooters—so the train could run either way.

In the celebrated iron-clad train of the English, in the recent Egyptian war, the engine was at first placed in the middle, and subsequently next to the end. Sand-bags were hung round the engine-boiler, and were afterwards supplemented with railway iron placed horizontally, and 1-4 and 3-4-inch iron plate around the working parts. There was a reserve engine, usually on the other track. Two spare trucks, containing railway iron, spikes, etc., for repairs, were pushed ahead to explode mines. Other trucks carried Gatlings and Nordenfelts; the sides of the trucks were built up and strengthened by iron plates protecting the cannon with their limbers. There was a truck loaded with gun-cotton, detonators and Bickford fuzes, to destroy the line, if necessary. The ammunition car was protected by short railway iron; on each side was a baulk of timbers, and on top a layer of rails, three or four of which were bolted down. A truck carrying a steam-crane for lifting guns, was provided. The rear car carried Gatlings. Lanterns, candles, gun-slings, stretchers, a collapsible boat, etc., were carried. The order in which the cars came, further than already described, is unknown.

7. Be prudent in watching engineers, firemen, conductors and train hands.

Do not annoy, but persist. They may know of danger, and, to save their own lives, will tell you.

In an emergency, soldiers and officers may be used who know how to run an engine. In Pennsylvania, in 1877, engineers were enlisted; and the Adjutant-General states that "The knowledge that the State was ready to supply its own men to perform railway service, had much to do with avoiding further difficulty." (Report. 1878, p. 17.) Gen. Brinton (p. 44) states: "I arrested the engineers and firemen of the train, and had them placed on their engines with a guard over them, who had positive orders, on the least signs of insubordination, to shoot them, and let the engines be run thereafter by our own crews." A case is mentioned where an engineer not guarded ran the train out six miles, and, leaving the train there, returned with the engine. The car-platforms should be guarded. An unwise lieutenant, in the troubles of 1877, in New York, permitted a crowd to enter

his car, and as a result, he and his detachment were disarmed, captured, and paraded through the surrounding country.

8. Gen. Brinton mentions a case, in '77, of a railroad running under a roadway from which rocks might be dropped. He detailed six companies to make a detour by a public road. As a result, seventy-one persons were captured and a crowd dispersed.

Referring to the case of soaping rails at Hornellsville, where sand proved worthless, Gen. Molineux says it is ridiculous that an officer should be outdone in this way, that an old lady might have suggested dishcloths and sand.

The 4th Pennsylvania were attacked in a cut by rioters, and, having no flankers out, were totally unprepared. Out of 253 men present, not more than fifty escaped without injuries more or less serious. Gen. Brinton reports (p. 46) that: "Companies D and E of the 1st Regiment were deployed as skirmishers along the railroad in front of the train, followed by a construction-gang furnished by the railroad company, who carefully examined the road-bed and made the necessary repairs, where tracks and switches had been misplaced."

9. Don't load pieces and fix bayonets in cars in transit. Liquor is to be rigidly guarded against.

10. "Butts to the front" may prove more expedient than "Charge bayonets."

11. Don't stack arms in public places. Don't let a man leave the ranks, unless absolutely necessary; in such a case his piece should be left with the man next to him in ranks.

12. In guarding working parties, buildings, culverts, etc., one sentry, by failing to do his duty, may permit the cordon to be broken—to obviate this, lengthen the posts and put two or three men on post together. These may rally, one person may be detached to prevent a person from passing through. Guard duty of this kind is difficult; there would be temptation for a single soldier, particularly for a militiaman, and this is one reason why it will be expedient to unite several.

13. Contact and conversation with the crowd is to be largely avoided; it must not be permitted all along the line. In certain cases information may be obtained. One party of citizens is to retire before another is permitted to approach. Talking may be stopped by calling troops to attention.

At Hornellsville the military commander made an agreement with the strikers that the telegraph lines were to stand and be used by both parties.

In 1877, strikers tapped the wires in Pennsylvania: this emphasizes the necessity, previously stated, of employing a cipher. The importance of keeping open communication by wire is seen in the statement that nearly 6000 official messages passed over the police wires in New York during the riots in 1863.

14. Newspaper reporters are to be treated without churlishness, thus avoiding animosity and consequent injury to the Service. Information, not public, should be refused in polite terms. The slow assembling of the troops in Pittsburgh was largely due to the hostility of newspapers to an unpopular corporation.

15. Have confidence in obeying all lawful orders, and execute with alacrity. If the bayonet is called upon to sustain the law, the law should in turn sustain the bayonet.

16. Obey vague orders in the manner you deem wisest, and then ask for more explicit orders.

If ordered, for instance, to protect a junction, proceed at once; drive off the intruders, secure points for defense, make your men comfortable, establish guards, secure communications. Don't place too many men on duty at one time; it weakens and fatigues.

The Erie Road, to prevent the swelling of the mob, ordered regular trains not to run into Hornellsville. A statute will be found in most States making interference with the running of trains or the placing of obstructions on a railroad track a felony, and where such measures are anticipated, it might be wise for the Governor to call attention to the statute and offer suitable rewards for the arrest and conviction of offenders. This was done by Gov. Robinson, in 1877.

THE END.

DISCUSSION OF "ARMAMENT OF THE OUTSIDE LINE."*

REAR ADMIRAL E. SIMPSON, U. S. N.—Having been favored with an advanced copy of the paper on the "Armament of the Outside Line of Defense" by Lieut. Weaver, of the U. S. Artillery, with a request to submit remarks in the way of discussion, I take advantage of the opportunity to contribute a few words.

We have to thank Lieut. Weaver for putting into a condensed form the results of numerous experiments on the action of shot of different forms on material of different characters, and particularly for information on the matter of the surface area of plate utilized in the work of resisting impact of projectiles, which, from his showing, is less than is generally supposed, showing that, as the whole weight of the plate in past experiments has not participated in the work of resistance, the resistances recorded per ton of plate have been less than they were, in fact.

After considering the question of resistance, the development of manufacture and the fact that the weight of armor of a battle-ship has a limit, the author assumes that armor capable of resisting 1500 foot tons of projectile energy per ton of plate, may be taken as the maximum resistance to be offered to the artillery of the batteries on shore, that the thickness required will be twenty inches, and that guns larger than eighteen inches caliber will not be floated against the defenses of our coast.

The author then establishes a 20-inch gun as the standard for the defense of the outer line, and assuming an initial velocity for the 4500 pounds projectile of 2000 feet per second, and having determined that to destroy the plate there is required 55,500-foot tons of projectile energy, he finds that he will have the energy at a range of 11,806 yards, or about six miles, the remaining velocity of the projectile at that distance being 1333 feet per second. He says, "Within this limit of range the gun would overmatch the plate, beyond it the plate would have the advantage."

What is said about the effectiveness of the larger caliber-gun cannot be gainsayed, but I deprecate what Lieut. Weaver says when he draws an unfavorable comparison with the 16-inch gun recommended by the Fortifications Board, because I think he has stated the resistance of the target at too high a figure. I believe that battle-ships with twenty inches of armor will be very exceptional constructions, and even such will carry it on a limited space. The heaviest armored ships must have a large proportion of hull unprotected, and the thickness of interior armored bulkheads will always be found to be far inferior in resistance to what is supposed by the author. He assumes that the heavier gun is needed in order to affect any part of the ship, whereas a luckily planted shot of much inferior caliber may produce most serious results. Of course, the conclusion that he arrives at, as to the necessity of the 20-inch gun, rests on the premise

* See Lieut. Weaver's Essay, p. 169, this Journal.

that the resistance to be encountered requires this development of energy; I do not think that a battle-ship of the most protected character can be regarded as a target without weak joints, and though I approve of having a surplus of offensive power, I doubt if it is necessary to advance to such mammoth proportions to secure it. Considering the resistance offered by the present battle-ship, the 16-inch gun is sufficient for all purposes of *horizontal* fire.

But there is a point, or rather an omission, in the paper of Lieut. Weaver, on which I desire to remark. In considering the outer line of our coast-defense, I always look upon the mortar as the chief arm, that is for the extreme outer line. In the comparison made in the latter portions of the paper between the guns recommended by the Fortifications Board and those suggested by himself, he confines himself to citing the number of 16-inch guns proposed by the Board, no mention being made of the other guns and mortars included in their list. This is in accordance with a remark made by the author to the effect that he confines his "attention to the largest guns of the outer line, which alone are dealt with in this paper"; but to one who cannot refer to the report of the Board, this omission would give an erroneous impression as to its action. Under the heading of "Portland" the whole list of defensive battery proposed by the Board is cited, but in all other places referred to, there is mention only of the number of 16-inch guns, and these, as in the case of the proposed 20-inch guns, are designed for horizontal fire. The work of the mortar is supposed to be the opening ceremony in defense, the horizontal fire of the rifled gun is supplementary. Progress in vertical fire has kept place with that of horizontal fire. If I were to make an objection to the recommendations of the Board, it would be to the caliber of the mortars proposed, not to that of the guns. The highest caliber of the mortars proposed by the Board is twelve inches. I hazard the opinion that increase in the caliber of this arm would aid the defense more than advancing beyond the 16-inch gun for horizontal fire, and with the mortar we have the remarkable quality of increase of destructive effect with increase of range. At the distance of five miles, with a 12-inch mortar, we can count on a falling energy of 72.9-foot tons per inch of circumference, with an elevation of sixty degrees, and the accuracy of the breech-loading rifled mortar may be taken at 50 per cent. of that of the horizontal fire; the attack is made at the weakest part of a ship, and is the most demoralized of all kinds of fire.

I would be very glad if Lieut. Weaver's allusions to the defenses of the eastern entrance to Long Island Sound could have the effect of bringing about a more serious consideration of the strategic importance of that point as a defense not only to New York, but to all the cities on the Sound. This is the real deep water entrance to New York; if it were made impregnable to attack, security would be afforded to a large extent of most valuable coast, and the present entrance to New York might be absolutely closed with torpedoes sown broadcast in all the channels of the bars. The Fortifications Board seems to have disregarded this point because of the non-existence of any especially important place at that locality, but true strategy would seem to indicate it as the outer portal which, if made secure, would insure the safety of all within.

CAPTAIN A. T. MAHAN, U. S. N.—Assuming that the word defense is limited in the present paper to its strict meaning, excluding offensive returns; and that the power of such defense can only be exercised when the enemy comes within its range by his own act, I am in accord with the general proposition of the essayist that shore guns should be superior in weight to ship fire, and that that superiority should be carried to as great a range as can be done by increasing the power of the gun within reasonable increase of expense. To decide whether the particular size of guns, 20-inch, advocated by him will confer such advantage, without excessive increase of cost, requires a thorough technical knowledge of the subject, which I do not possess.

I think there is a tendency to undervalue the protection a ship derives from her constant motion and from the difficulty of the gunner's knowing her exact position at the moment of firing. Just as in experimental contests between guns and armor, all the conditions are made to favor the gun (with the very proper object of subjecting the armor to extreme proof); so in the matter of accuracy, results obtained against stationary targets, at known distances, with exceptionally good ballistic conditions, are assumed as probable in action. It is to be wished that the essayist had given the estimated dangerous space for a ship of certain size at the elevation necessary to carry six miles. Diminished probability of hitting involves increased number of guns and so increased cost.

In any attempt to reduce the defenses of a place, or to force a passage, ships must come within the range of much smaller guns than those advocated; but when it is a question of merely shelling, the ship will have the advantage of a vastly larger target, absolutely stationary, and upon which moral and material considerations, such as bodily fear, loss of property, and the consequent pressure of the people on the Government, etc., will have an effect much greater than can be predicated of a military organization like a ship of war. If bombardment promise adequate military results, the power of the biggest guns on shore to control ships at six miles distance, may be doubted.

When ships are forced, in order to get within shelling range of a city, to approach within two miles of the exterior line of defense they are within the power of smaller guns; but where, from the natural surroundings, they can shell at a distance of six miles from such defense, I incline to think that coast-defense ships and torpedo, probably submarine boats, must come into play. I am keenly alive to the fact that floating defense is less accurate, more sinkable, and more limited in weight than that established on shore. On the other hand, it has mobile offensive power also, which is the needed complement of all defensive preparations, and for this reason should be found in every principal seaport; but when a six-mile range is necessary to prevent shelling, the floating defenses should be greatly increased. Bombardments will require for accurate firing, good weather, in which coast-defense ships of much heavier armor than sea-going ships can come out; and hydrographic features will frequently enable them to take positions where the enemy's ships cannot reach them. For torpedo warfare the defense can always be stronger than the assailant, being nearer his base.

I incline to think then that, to attack, ships must come within effective range of smaller guns; while to prevent bombardments the main reliance must be placed upon moving floating defenses when guns cannot be established on shore nearer than six miles to the probable position of assailants.

COL. W. P. CRAIGHILL, CORPS OF ENGINEERS, U. S. A.—The paper of Lt. Weaver is very interesting and instructive. Its subject is one of the greatest importance. The apathy exhibited concerning it in Congress and among the people generally, even those living and owning great properties in New York and other almost defenseless cities, is wonderful. It is probable nothing but a frightful disaster at some special locality will arouse its inhabitants to a proper appreciation of the situation, and then it will be too late for that community. If the whole country profits by that experience and promptly proceeds to use the proper preventives elsewhere, much general good will flow from a great local misfortune.

Lt. Weaver confines attention entirely to the use of the largest guns using direct fire for "the armament of the outside line of defense." It may be well to add a few general words concerning the use of mortars and other means on that line. It should not be forgotten that a projectile of much less weight than would be thrown against the sides of an iron-clad by one of Lt. W.'s 20"-guns, if sent from a mortar and falling upon the deck of the same ship, would probably inflict a fatal injury.

A 20"-gun and its apparatus is a very expensive thing to obtain and use, and a huge, slow thing to handle, even with the aid of the best modern mechanical appliances. When in position for use, such a machine occupies a large space which must be made secure at great expense. It is a large mark for the enemy.

The accuracy of fire of the gun is greater, but much progress has been made in improving that of the mortar. The mortar may often be located where the gun could not, and it has other advantages which should prevent it from being ignored in the armament of the outer line, where indeed it should on the contrary have a large representation.

The relative expense of mounting guns on shore and afloat is so much in favor of the shore-guns as to admit of having the number of the heaviest shore-guns for the same money very much the greater; and this is a very important point in deciding as to the *extent or degree* of the armament of the outer line, or of either line, after its *kind* has been decided on.

Another matter to be noticed in this connection seems to be the fashion of dwelling altogether on the need of the largest guns, and saying nothing about the advantageous use of smaller guns, even on the outer line, in connection with torpedoes, even when both guns and torpedoes are judiciously placed.

The fundamental idea of the defense should be that no hostile gun be allowed (if it can be prevented) to be floated as near the outer limit of the point to be defended as its extreme range. This may theoretically be prevented by a crushing fire of the largest guns and mortars on the outer line, without the use of torpedoes or obstructions of any kind.

The same thing may be accomplished by the Chinese method of an actual stoppage of the channels of approach. If the worst comes, this means of resistance may be resorted to, but besides being unworthy a great people, it is as perfect a blockade for our own ports as any enemy could make or desire.

A system of fixed torpedoes, judiciously arranged and under the fire of well protected guns of smaller calibers, would add greatly to the strength of the outer line, and might under some circumstances make a successful defense without the aid of the largest guns. When such a system of torpedoes is known to be in place, the great iron-clads are not going to attempt to run over them *ad libitum*. The smaller vessels and boats will be sent to reconnoitre, and if possible remove or neutralize these formidable obstructions. Against such craft the smaller guns are not only sufficient in efficiency, but they are much more easily, rapidly and cheaply obtained, placed and used than the greatest guns.

Everything in the way of defensive arrangement is now suspended, while Congress is thinking about the provision of big guns. What has been said shows the importance of other things about which there need be no such delay or expense in procuring and placing. Moreover, the emplacements the great guns will need for their proper use require much time for the preparation of firm foundations and secure protection, etc., in advance of the mounting of the guns. These *preparations* for "the armament of the outer line" could and should be *now* in progress.

GEN. H. L. ABBOT, COL. CORPS OF ENGRS., U. S. A.—In the prevailing popular lack of interest respecting coast defense it is encouraging to engineers to see officers of other Arms of the Service devoting time and labor to the study of the subject. Moreover, a paper like this is useful as a basis for technical discussion which, it is to be hoped, may stimulate further investigation in a field still far from being exhausted. While, therefore, I cannot agree with Lieut. Weaver in his criticisms of the conclusions of the Special Fortifications Board appointed under Act of Congress in 1885, or more

generally when he rejects principles now recognized by the military engineers of all nations, the Institution is certainly indebted to him for a suggestive paper.

The author does not define his "outside line of defense," but it may be supposed to mean the outermost belt to be covered by the fire of the land armament. This he assumes must be defended by horizontal fire; and he proceeds to argue from the indications of an original formula that guns 20 inches in caliber and nearly double in weight to any now existing, are essential. He believes that they should be able to pierce 20 inches of steel armor at a range of six miles; that their fire can be accurately directed against ships at that distance; that without them the coast cannot be properly defended; that ships cannot carry so large guns; and that 8-inch, 10-inch and 12-inch modern high-power guns are "completely useless" for all "outside work." On these points, and on many others of minor importance, I am constrained to differ from his conclusions.

Waiving all theoretical objections, I cannot accept his new formula because it is based on old observations *where much of the energy was wasted on the projectile* and wholly ignores recent progress in the manufacture. Holtzer steel projectiles, 12 inches in caliber, now perforate uninjured 16 inches of steel armor. A 16.5-inch St. Chamond steel projectile, with a striking velocity of only 1410 feet per second, has perforated a 19.7-inch Creusot steel armor-plate, and fallen 400 meters beyond it, upset only one-quarter of an inch. Its energy was about 24,000 foot-tons; while by Lieut. Weaver's new formula, upon which he bases his proposed system of ordnance, 36,700 foot-tons would be required simply to break up the plate. Even 8-inch projectiles now possess great destructive power against modern armor-plates. Thus one made by Krupp weighing 300 pounds, fired with a striking velocity of 1800 feet per second, has perforated a 16-inch compound plate backed by 8 inches of oak, and fallen 737 yards beyond the target upset only about one-quarter of an inch. In a word, Lieut. Weaver ignores recent progress, greatly underestimates the power of modern artillery, and is thus led to demand guns larger than are necessary even to perform the work which he thinks should be thrown upon them.

But he also misapprehends another important element of the problem. Ships are now following the example of knights after the introduction of gunpowder, and are throwing off their heavy armor except from a small portion of the broadside, trusting to a submerged armored deck and artificial buoyancy for protection. Lieut. Weaver assumes that his target is 250x25 feet in area, while in truth a belt 100x10 feet would probably give an exaggerated idea of the area covered by 20 inches of steel. Outside this belt the armor is much less resisting, and for large portions of the side none whatever is provided. The stability of the ship would certainly be impaired by the destruction of these exposed ends, and some good authorities claim that it would be destroyed. Hence any large shell carrying an explosive charge will be dreaded, and to be effective excessively large calibers are not essential. A 16-inch, a 12-inch, or even a 10-inch projectile would be nearly as dangerous against five-sixths of his assumed target as his proposed 20-inch projectile; and, used in numbers inversely proportional to their cost, they would be vastly more effective. This matter, it may be assumed, was duly considered by the Fortifications Board, although the reasons were not given in detail for its recommendations. In this connection it should be noted that a fair construction of the recommendations of this Board does not restrict the calibers to those actually named. At that date the 16-inch 110-ton gun was the largest in existence, and a responsible Board ordered to present a definite plan would doubtless hesitate to plunge into the region of speculation in its recommendations. It is quite certain that if the development of ordnance shall require the introduction of larger calibers, our seacoast armament

will not be allowed to fall behind that of the rest of the world. The spirit and not the letter of the approved project will be considered.

In his remarks on the precision of artillery fire, I think that Lieut. Weaver has been misled, as many are, by the manner in which range practice is commonly discussed. When several shots are fired under identical conditions, as was the case in both instances at Meppen to which he refers, the results only indicate the wandering of the projectile from its mean trajectory by reason of defects of manufacture of gun and projectile, variations in the strength of the powder, and whatever atmospheric changes happened to affect the flight at the time of the firing. Such records reveal nothing as to the effects of *errors in pointing*, errors which, even in peace practice at a stationary target at a range of six miles, will demand many trial shots before a hit is obtained. That this must be so will be apparent to any one familiar with the practical measurement of angles. Thus let us consider the case of the ship target which Lieut. Weaver assumes to be 25 feet high. At 6 miles it subtends an angle of less than 3 minutes, and an error of $1\frac{1}{2}$ minutes in pointing will therefore throw the projectile off its surface. But since the least count of the vernier of an ordinary railroad transit is 1 minute, and the angle of fall of the projectile at this range is about 16 degrees, the chances of hitting such a target without many trial shots, when the range is only approximately known, must be regarded as small, even in peace practice. But now add to these mechanical difficulties the excitement of action, the clouds of smoke in the atmosphere, the ship shifting her position in a manner impossible to detect because more or less veiled by her own smoke, and I hope Lieut. Weaver will not object to the suggestion, from one who has "worn the red" in war, that it will be prudent to estimate many misses for one hit. Krupp's tables of practice are no guide in such problems. If 20-inch guns afforded the only protection against the bombardment of our ports, I confess that I should despair of success. The enemy's target is a large area; ours, an almost invisible line.

The plan of defense against distant bombardment, recommended by the Fortifications Board, and which Lieut. Weaver seems to entirely condemn and even ignore, is radically different from this. Instead of attacking the *side* of the ship, where many blows may be needful for a decisive result, the *deck* is to be assailed. It has more than double the area of the side; it is covered only by very light armor; through it all the vital parts of the ship, the magazines, the boilers, and the machinery (which are perfectly protected against *horizontal* fire by the water), are exposed to attack. At long ranges the projectiles of a 12-inch mortar have ample energy to plunge through deck and bottom, and every hit, therefore, threatens destruction. To correct for inaccuracy of aim, the mortars are to be multiplied and so grouped that sixteen of them become a unit, pointed and controlled by the commandant in person. As happens in sporting, when the game is too small to be hit with a rifle, the latter is exchanged for a shot-gun; but in the case under consideration, our "shot-gun" carries a charge of $625 \times 16 = 10,000$ pounds of metal, and distributes it so effectively over an area twenty times the size of the ship, that a fatal blow will not be long delayed if she ventures to remain to receive it. At the cost of one 20-inch gun many batteries of this character may be provided, and, supplemented by a few large mines and by a swarm of naval torpedo boats ready to rush upon the enemy as soon as he becomes blinded by his own smoke, such mortar batteries now constitute the true defense of what Lieut. Weaver calls his "outside line."

There are many other points in this paper to which I would like to advert, but one must suffice. From his remarks upon the defense of the coast of Maine, it appears that Lieut. Weaver does not understand that the system of sea-coast defense in this country is now, and always has been, limited to such works as will *compel the enemy to*

disembark before he can inflict serious injury. We can then grapple him with our land forces, in which we are or should be much stronger than he. So long as destruction can be dealt from ships, an insignificant opponent may play havoc along the shore. It will be time enough to consider how to meet a descent in Penobscot Bay when our coasts are so well defended against purely naval attacks as to force the enemy to resort to invasion before decisive results can be achieved.

LIEUT. A. D. SCHENCK, 2D U. S. ART.—It appears strange that Lt. Weaver has deemed it necessary to open his discussion with an attempt to demonstrate an axiom. Yet any one who carefully considers the report of the Fortifications Board to which he alludes, will be convinced that to some persons in authority, self-evident truths are apparently not so evident as they are generally supposed to be. That "land-fire must be of a higher power than sea-fire," has been held to be an axiom in the engineering and artillery science of sea-coast defense time out of mind, the only limit being the ability of the mechanical engineer to construct a heavy gun, and in the case of an impetuous nation perhaps the cost also.

Before armor protection upon seagoing ships had made any considerable advance, we demanded a power of at least two to one in the sea-coast as against the naval gun. When the possibility arose that a 20-in. gun might be carried behind heavy armor, we require, and Genl. Rodman projected, and would have constructed a 30-in. gun to meet this condition, had the day of his gun lasted but a little longer. Expressed in the simplest terms, the power of this gun would have been about 3.5 times that of the expected naval one. With the great increase in the size of ships, and in the defensive power of armor, the demand for this measure of power in the sea-coast gun most certainly has not diminished. A cursory consideration of this great improvement in the armored defense of ships, coupled with the fact that naval guns are already afloat capable of firing over 2300 pounds of projectile, indicates that the authority of our recent practices would be an ample one upon which to demand at once a 25-in. rifle gun, firing a 9300 pound projectile, as the gun of maximum power required, and not the comparatively powerless one which Lt. Weaver suggests.

This being the status of the question, what must be thought of the wisdom of providing guns which are at best barely equal in power to those which may already be brought against us?

The difficulty in the construction of the gun absolutely required is not the matter of moment for consideration. Let the Government pay down the necessary money and the gun will be forthcoming; not however, until the present generation is dead and buried, if we are to have only a Government gunfactory, where gunmaking is to be tinkered and experimented with, beginning with a caliber of 8-in.

When increased range is proposed, appears the perennial pessimist with the objection that it will be of no avail because a ship cannot be hit. It matters not that such measure of accuracy as Lt. Weaver points out has already been achieved. It was considered a reasonable expectation that ships would be hit at 3000 yards as an effective range with our old guns. Lt. Weaver demands one of 15,000 yards. Given the necessary gun, the accuracy of fire is just as assured as it is to-day with the rifle musket at 1000 yards, as compared with the old smooth-bore at 200.

The necessity for "standing off" our enemy beyond his range of the city we are defending is absolute. Placing dependence upon the supposed fact that the naval gun cannot secure the full extent of its range for want of elevation, is sheer foolishness to say the least. Whenever the naval authorities are convinced of the necessity for great elevation, all they have to do is to pay for it, and the mechanical engineer will secure him whatever may be desired, with facility for readily working the gun, and safety to the ship.

It is suggested that the method of expressing relative weight of projectiles by length in calibers is too crude to merit consideration, owing to the fact that not only the shape but density differ so much. When accuracy is required the expression should be in terms of the solid cast-iron sphere of equal caliber which is the simplest, or in terms of the area of cross-section, etc. As an instance, Lt. Weaver asserts that 2300 pounds as the weight of a projectile for a 16-in. gun "is a most liberal allowance." Krupp's heavy projectiles for his most powerful guns have a ratio of 4.5, and one relatively as heavy for a 16-in. gun would weigh 2385 pounds, and one for Lt. Weaver's 20-in. gun 4775. Here it may be added that a ratio of 4.5 is not necessarily to be accepted as the limit, if greater power and accuracy is to be secured with a higher one.

It may safely be asserted, as another axiom connected with the problem of sea-coast defense, that the adoption of any system of guns in which the gunners—the artillery—have no voice, but which is left to the design of the gunmakers, without practical knowledge of the requirements of such defense, or responsibility therefor in the event of war, will in the very nature of things, inevitably prove a lamentable failure.

Lt. Weaver will not have to search far into our past history to find a case of the "undeserved reproach cast upon the artillery for want of proper material." When Genl. Grant started out upon his last campaign by cutting down his artillery one-half, and then again reducing the remainder by a half before that campaign was ended; it was not because the personnel of the artillery after three years' of war experience was not up to the proper standard, nor that a strong force of artillery if properly armed was not peculiarly suited to the General's purposes, but because the *materiel* was entirely inadequate to the requirements of the time; and this notwithstanding the fact that other military nations, during a time of peace, had already developed field guns of superior power, while we had at hand the experiences of a tremendous war, and the gunmakers commanded a wealth of money without stint.

COMDR. W. J. SAMPSON, U. S. N.—The author's comprehensive view of his subject is commendable; when, however, details are reached, he will find, I think, that both Army and Navy officers have objections to make. They will say that it is unwise (in the first place) to base a system of defense upon the use of guns not yet in existence, the difficulties of whose construction, indeed, are so great that they have scarcely yet been thought of. After several years of constant effort, the Navy has fired its first 10-in. gun, and even that is, in part, a foreign production. Scarcely so far as this has the Army progressed; and there is no promise that in the next five years any American manufacturer will produce a 16-in. gun. Shall we, then, defer the defense of our coast until 20-in. guns can be constructed?

Though, if at liberty to assume the existence of any desired means of defense, why stop at the conception of a 20-in. gun?

I think the Fortifications Board was right, three years ago, to recommend what was practicable, and what then was and still remains the extreme limit reached in practical gun construction. To have recommended otherwise would have laid the Board open to the charge of trifling. It was forced to recommend something to be *done*, not something to be merely discussed.

Proper subjects for discussion are such propositions as the lecturer has advanced. The Military Service Institution is the place for them, and they are interesting because they constitute a reasonable look into the future; but, in the present state of Military Science, they certainly permit wide differences of opinion.

Again:—

The assumption that ships must mount lighter guns than shore-batteries is certainly in harmony with our conception of the eternal fitness of things; but up to the present time it is not true, and judging from the progress made in naval architecture

while ordnance has been making such strides, we are warranted in thinking that whenever it is considered desirable vessels can be constructed to mount any guns that will be built. I think most naval officers feel that the practical limit has been reached in the size of guns for ships. The extreme range of guns already in use cannot be made use of from ship, and so far as range is concerned very little would be gained by increasing the size of the gun. The ship must first be built to endure the recoil at large angles of elevation of guns already mounted.

This can be done.

Should the future development of ordnance turn to an increase in the explosive energy of the projectile, rather than to an increase in its size, the advantage would incline to the ship rather than the shore gun.

A third subject—"The selection of the best site for mounting the guns for the defense of a city," is a matter of grave importance, and upon this head I am confident the lecturer will find many officers to disagree with his views.

It is not unlikely that military men undervalue the peculiar advantage of a gun afloat. The instability and destructibility of its platform are disadvantages. On the other hand, its mobility is a most comprehensive advantage.

Consider, for a moment, the defense of Boston against bombardment! The lecturer considers it practicable to defend it, as he places the guns. Admitting for the sake of argument that the 20-inch guns will be constructed and mounted, there are conditions under which it would be impossible to defend the city from bombardment from Broad Sound.

1st, at night a vessel or squadron could steam into the Sound and their position would be revealed only by the flash of their guns, or, under favorable conditions of weather for the defense, the search light might be of assistance at such long ranges; and in a fog, which would render the ships invisible from the shore; in both these cases, the ship could determine her position with sufficient accuracy to drop shell in the city with absolute certainty.

Again, consider the eastern defenses of New York City. The lecturer places the main defensive works at the eastern end of the Sound; but can guns, of whatever caliber, placed on Fishers' and Gull Islands, prevent the passage of a ship or squadron into the Sound?

Submarine mines could not be used, and inside the Sound there would be perfect safety. Moving at a high rate of speed, as a vessel could do, under such conditions, aided by darkness or fog, or smoke, the chances would be greatly in her favor, and it would be found that without a well-developed defense at the narrow passage between Throgg's Neck and Willet's Point, where submarine mines could be used, New York City would be at the mercy of any enterprising foe.

CORRESPONDENCE.

FORT NIAGARA, 1812-13.

(From a Foreign Correspondent of Council.)

IN the Library of Queen's College, Kingston, there is an old Fort Niagara order-book, from which, by the courtesy of the librarian, I am enabled to take some extracts, which may be of interest to your readers.

The first order in this book is dated November 15th, 1812, and this, and all those subsequent, is signed by Lieutenant-Colonel George McFeely. It commences: "Having been assigned to the command of this important post by General Smyth, I shall expect that every exertion will be made by both officers and men to promote the general cause and the defense of this place; the duties, though severe and arduous, it is expected will be performed with cheerfulness and promptitude by all."

The next order, and a very large proportion of the remainder, is devoted to the order for assembly, and the promulgation of the proceedings, of a court-martial. The prisoner was here charged with disobedience of orders and was sentenced to "be chained to a wheel-barrow one week at hard labour."

Whiskey seems to have been always the great interior foe, but on the 17th of November it became necessary to devote attention to the enemy without. "From the critical situation that we are placed in at present it is expected that every officer and soldier will use their utmost exertions to put this garrison in a state of defense," and two days later: "The captains of companies will have their men's cartridge-boxes filled with ball cartridge this evening, they will see that their men are provided with good flints and cause their men to keep their guns in the best of order." Next day: "Soldiers are not to take off their cloaths when they lie down, they are to sleep on their arms, that in case of alarm they can turn out at a moment."

On the 6th December five soldiers were tried by a court-martial for various offenses, theft, insubordination, drunkenness and fighting. The record says: "William Chambers was tried for stealing cloaths and sentenced to receive twelve cobs on his bare posterior." "George Erwig was tried for striking and abusing a non-commissioned officer and sentenced to wear a ball and chain for ten days, that he have the shoulder-knot he made to insult the N. C. officer with sewed to the back of his coat for the same time, etc."

The administration of justice seems to have demanded no small exertions in this garrison, for there are almost daily records of courts-martial and little else. On January 5th, 1813, there was a woman in it! "The court proceeded to the trial of Matthew Campbell, charged for striking and cutting Catherine Brown with a knife. Corporal Toy being sworn, says 'Matthew Campbell took a kittle belonging to Catherine Brown to fry his meat in. Catherine Brown went to take the kittle off the fire, when Campbell siezed holt of a knife, struck her in the arm and cut her.'" Several

other witnesses having corroborated this statement, the court find the prisoner guilty and "sentence him to ten cobbs and two weeks at hard labour." The commandant shows his nice feeling when he confirms the sentence in the following terms: "The commanding officer approves of the above sentence and orders that it be put into execution this evening at parade. If the woman that Campbell injured will acquit him the commanding officer has no objection."

But the peace of the little garrison was soon again disturbed. On the 24th of the same month, Jacob Snowden was tried for striking Corporal Heafer. The first witness "doth say, the prisoner supposing that Corporal Heafer meant to injure or assault his mother, jumped up and pushed back Corporal Heafer." Another witness says that "Heafer called Mrs. Snowden an old heifer." Notwithstanding the evident provocation the gallant Jacob is sentenced to two weeks hard labor.

A general order dated Buffalo, 20th April, is next published, and signed by order of Major-General Lewis, promulgating the proceedings of a General Court Martial which tried Amos Waterman for repeated acts of desertion. The Court sentenced the prisoner to be shot to death. The General approves the sentence but remits execution and adds, "The Commander-in-Chief hopes that these several acts of clemency will not be misconstrued by the Army he has the honor to command. Desertion in the midst of War he considers the foulest offense a soldier can commit, and one which generally deserves and demands the most exemplary punishments, etc."

On the 19th April, a brigade appears to have been formed of the 5th, 13th, 22d and 23d Regiments, the command of which was assumed by Lieut.-Colonel Boyd, "who, while he has the honor to announce himself to the troops, and assumes the command, feels his responsibility assured by the known reputation of the officers and the gallantry of the men." Boyd takes command of Fort Niagara on the 1st May.

On the 4th May, a general order is published which assigns to Major-General Lewis the command of the division consisting of the two brigades commanded by Generals Boyd and Winder, and on the following day, "Lieut.-Colonel McFeely will please to superintend the hospitals and see that every comfort and convenience that can be procured is afforded to the sick and wounded, and he will encourage the surgeons to the greatest vigilance and attention, and report any neglect or inattention."

Here we lose Colonel McFeely who appears to have had a sufficiently troublesome command. In approving one of the too numerous courts martial which took place under his orders, for the trial of a private on a charge of insubordination he is eloquent. "The want of respect from the soldiers to non-commissioned officers is a serious evil. Extinction of all military subordination is calculated to make an army but another term for a mob. Respect and obedience must be observed from the Corporal to the General agreeable to rank, or all order ceases. It is the military Polar Star, the paladium of their salvation." The effect of this peroration does not appear in any diminution of the numbers of subsequent delinquences.

After May 12th, the orders in this book cease, but there is a long list of British prisoners of war and deserters from the British Army. The total number in Fort Niagara on the 19th June is forty-nine. Then follows another long list of British prisoners taken at the capture of Fort George on the 27th May, making a total of ninety-five, including four deserters.

At the end of this book the orders recommence, the first being dated 10th October. They continue up to the 16th December, and are signed by order of Brigadier-General McClure. They exhibit a series of elaborate precautions against the entrance into the fort of Britishers, spies and whiskey. This latter enemy seems to have been greatly dreaded. "No person will be allowed to pass inside the barrack-gate with a pail, bucket, camp-kettle, tin pan, canteen, or any kind of cup that can contain spirits, etc." A long order of the 13th December shows the distribution of the troops of the garrison in case of attack, and the manner in which the defense was to be conducted.

E. N.

REVIEWS.

THE DEFENSE OF THE SEA-COAST OF THE UNITED STATES.*

THIS little work, of 164 pages, contains a course of five lectures upon one of the most interesting, and, at present, perhaps the most important military question of the day, so far as this question is concerned. These lectures were delivered in the regular course at the Naval War College, and are now published by Van Nostrand & Co. That the subjects treated are ably handled, the name of the author is sufficient guarantee, for General Abbot is not only a military engineer, of conspicuous ability, but one who has devoted many years of his life to the special study of some of the more abstruse problems connected with sea-coast defense.

In the first lecture General Abbot discusses the Art of War as applied to coast defense, showing that its problems are of the same nature as those presented by a rugged mountain chain, the deep bays and river-mouths of the one being the counterparts of the natural passes in the other. He says that the problem of coast defense is not a speciality in the Military Art, but contains elements common to all military undertakings. Nor can the co-operation of the Navy be left out of the calculations of the engineer. The Navy furnishes what may be called the cavalry scouts and skirmishers of the fortified line. One consideration therefor must be given to their requirements. Positions of strategical importance from a naval point of view must be fortified and held as naval bases, from which the scouts and skirmishers of the Navy may threaten, harass, or assail the enemy. The author points out several positions on our coasts which have this character, such as Narragansett Bay and Hampton Roads, the former being the natural base for naval operations against the ocean communications of an enemy operating against New York, by way of Long Island Sound, and the latter fulfilling a similar function with reference to the Chesapeake. He does not discuss the practicability of excluding an enemy from these inland seas, which is to be regretted, for the presence of a hostile fleet in either of them would be in itself little less than a national calamity. No householder would tolerate the presence of a burglar in his entry-hall, even if the rooms containing his valuables were all securely locked.

The author finds the principles of grand tactics imposing conditions on sea-coast defenses, and tying the hands of the engineer so far as the free use of torpedoes are concerned. The ability to act offensively is as important in sea-coast defenses as in any other fortified line.

In discussing the art of the Engineer, the author mixes it somewhat with the policy of the Engineer Department. To answer the question "What should a nation give for its life?" is hardly the province of the military engineer.

In defining the general features of sea-coast defense, the author is careful to state

* By Brevet Brig.-General Henry L. Abbot, U. S. Army, and Colonel of the Corps of Engineers. VAN NOSTRAND, New York, 1888.

that no system can be of universal application. Every position presents a special problem which must be studied by itself. Universal nostrums are prescribed only by quacks, whether medical or military, and are just as likely to kill as to cure.

The first step towards the solution of any problem of defense is to determine the size and character of the armament required. This the author deduces from his estimate of the number and caliber of the guns likely to be brought against the position. To form a reliable estimate requires an intimate knowledge of the navies of the world. Nor is this all. The problem is complicated by the conditions of the situation, the depth of the water, and the shape of the channel. The relative value of guns afloat and guns ashore also enters into the problem. This last question is treated at considerable length by the author, incidents of recent date being cited in evidence, and the conclusion reached is that, with guns of the same caliber, two afloat are about equal to one ashore.

Naval tactics against forts receive some attention at the close of the first lecture. Here the author naturally finds himself somewhat out of his element, but he cites a number of modern examples, and reaches the conclusion that ships-of-war in such a contest would fight at anchor, developing as broad a field of fire as practicable. He thinks that from five to ten ships per mile of front could be placed in position, and that from thirty to sixty guns per mile could be brought into action.

The second lecture is devoted to the economy of coast defense. In it the author discusses the "Limit of Judicious Outlay," and kindred subjects. The discussion is able and interesting, but, as already said, as an answer to the question, What should a nation pay for its life? it is hardly satisfactory. If, however, the nation is a parsimonious party, who arbitrarily determines to pay only a certain sum for his salvation, and commands his engineer to do the best he can with the money—which is not far from the actual situation in our case—then the second lecture stands first of the five in importance.

The third lecture opens with a discussion of the local features of positions, and the selection of sites for works intended to prevent the bombardment of cities, etc., the primary object being to keep an enemy at a distance beyond the range of his guns. The problem presents itself in the harbors of our coast in all degrees of difficulty, from the easy to the impossible. New Orleans may be taken as a type of the first, and the Dry Tortugas as a type of the second. The ruling element in the problem is the range and power of the enemy's guns. After a full discussion, the author concludes that to make the city safe, its defenses should be at least six miles distant.

But an enemy may elect to run the batteries of the defense, and the engineer must keep that contingency in view. In connection with this subject the author discusses the advantages and disadvantages of high and low sites; points in a channel calculated to restrict an enemy's development of front; points favorable to the employment of submarine mines, and other points of natural vantage, all of which must be considered by the engineer in the selection of a site.

But sites, however well selected, and however well fortified and armed, will not keep an enemy out unless the fire of the defenders be effective. Accuracy of aim has increased in importance as the caliber of cannon has increased, and now "Range-and Position-finding" must be made essential features in the training of artillerymen. The author discusses the merits of several foreign methods, and concludes that some similar system must be adopted in this country if the armament of our sea-coast forts, present or prospective, is to be made effective. We heartily agree with him.

The important question of cover from an enemy's shot is next taken up, and the merits of revolving turrets, armored casemates, lifts, disappearing carriages, and open barbette batteries are discussed at length. As to turrets, he concedes that they afford

the most perfect cover, and do not restrict the field of fire, and, in every way are desirable; but he recognizes in their cost a bar to their general adoption. Armored casemates he finds defective in so far as they limit the field of fire, and cannot turn their backs on the enemy to effect repairs, or temporarily to avoid punishment. Lifts, like turrets, afford an all-round fire, and have many incontestable merits and only one serious defect—they cost \$100,000 each. They seem to be the favorite with the Engineer Department. Two types of gun-lift, devised by General Duane, are described and discussed, and the author thinks that they would serve an excellent purpose in the defense of secondary ports. They are not recommended for first-class ports, perhaps, because the guns required for their defense are beyond the capacity of the lift.

Disappearing carriages, of which five distinct systems have been devised here and abroad, have many merits, counterbalanced however by the fact that most of them have been constructed to carry guns not exceeding five tons in weight. The King carriage—an American invention—carries a 25-ton gun, and has stood its trial successfully; and Sir William Armstrong manufactures a carriage capable of carrying a 70-ton gun.

Open batteries will be restricted to high sites in future. Simplicity and economy are their chief recommendations, although their efficiency has been greatly increased by the introduction of breech-loading guns.

Flanking batteries for the defense of submarine mines are essential parts of every modern system, and while machine-guns will no doubt be largely used for this purpose, the author sees in them a field of usefulness for our smooth-bore armament of 8" and 10" Rodman guns, and thinks that even our old masonry forts may be turned to account in this direction.

Magazines in future will occupy a tier of casemates under the batteries. Dampness, the great defect of underground magazines in the past, is now disregarded, as cartridges will be made up in advance, and preserved in waterproof cases.

The fourth lecture treats of mortars and submarine mines. The author recognizes in these instruments the only means of assailing an iron-clad enemy where he is weakest. In a long discussion upon the merits of vertical fire he shows that with the rifled mortar and its improved carriage, vertical fire can be made as accurate as horizontal fire, and, as against iron-clads, far more destructive. His description of the proposed sea-coast rifled mortar battery is to the artilleryman the first ray of hope in a long life of despair. With an outfit such as the author describes, artillerymen will be able to hit targets less than a ten-acre lot, which they have rarely been able to do in the past with the old outfit. By the new outfit precision has been added to destructiveness, and mortars become the handiest, instead of the clumsiest cannon in our system.

The conditions which should be fulfilled by any system of submarine mines are discussed at length, and methods of attack on such obstructions, by day or night, or during foggy weather, also receive attention. The author thinks that the electric light as a means of lighting up zones of obstructions has not been sufficiently tried yet to justify an opinion. The Pneumatic Dynamite gun, or mortar, as he prefers to call it, also occupies a doubtful position in his estimation. He fears that its use "could hardly fail to damage our own mines, and thus perform for the enemy work which it is the part of wisdom to force him to undertake for himself."

In the fifth and last lecture we find an admirable historical *résumé* of coast defense in America, from which we learn that we have had three distinct systems of coast defense since we became a nation, not counting one which scarcely deserves the name of a system, and belongs to the Colonial period, or the Revolution. The first regular system, constructed soon after the Revolutionary War, consisted of works like Fort

Columbus and Castle William. Among engineers this is known as the second system, the title of the first being awarded to the insignificant earthworks, which grew up before and during the Revolution. The second national system, known among engineers as General Totten's system, consisted of the elaborate works of masonry, which still form prominent features at the entrance of most of our harbors. This system was begun soon after the War of 1812, and construction under it continued for forty-five years. After the Civil War, a third national system was adopted. Masonry was abandoned, and earth was used for all kinds of cover. Specimens of all these types may be found on almost any of our sea-coast defensive reservations, and the author confesses that it is "a live question, what shall be done with them." A new system having been adopted, the old works are in the way.

The resistance of penetration offered by armor, masonry and earth, occupies several very interesting pages, and gives occasion for the introduction of a number of valuable formulæ on the subject. In closing this last lecture of the course, the author gives a statement in detail of the first cost of a sea-coast fortress, without its guns, and it is a startler.

The book is provided with an index, which largely enhances its value, and makes it a book of reference, which any naval or military man will find convenient to have on his shelves.

J. C.

FOR REVIEW.

Course of Lectures upon the Defense of the Sea-coast of the United States, Delivered before the U. S. Naval War College. By Bvt. Brig.-Gen. Henry L. Abbot, U. S. Army, Colonel Corps of Engineers. November, 1887. (New York.) D. Van Nostrand, 1888.

Southern Historical Society Papers, Vol. 15. Richmond, 1887. Paroles of the Army of Northern Virginia. R. E. Lee, Gen. C. S. A., Commanding, Surrendered at Appomattox C. H., Va., April 9, 1865, to Lieut.-Gen. U. S. Grant. Edited, with Introduction, by R. A. Brock, Sec'y Southern Historical Society.

OUR EXCHANGES.

[List of Periodicals in Exchange, with titles on leading articles of professional topics]

BRAZIL.

Revista Militar Argentina. January, 1888.

- The Gordon Monument.
- The English Soldier in the Colonies.
- Equipment and Armament of the Infantry in the U. S.
- Cavalry in Russia.
- The Military Organization in Germany.
- [The same, February, 1888.]
- The Action of Infantry Fire on the Battle Field.
- Cavalry Maneuvers.

ENGLAND.

Proceedings of the Royal Artillery Institution. January, 1888.

- The Maxim Automatic Machine Gun.
- The Arming of Personnel of Horse and Field Artillery.
- [The same, February, 1888.]
- A Dictionary of Explosives.
- The Question of Draught in Mountain Batteries.
- The Pneumatic Dynamite Torpedo Gun.
- [The same, March, 1888.]
- Suggestions for a Tactical Instruction for the Field Artillery
- Night Attacks.
- Mountain Artillery—its Organization, Equipment and Tactics.

Professional Papers of the Corps of Royal Engineers. 1886.

- Historical Sketch of the Defenses of Dover
- Historical Sketch of the Coast-Defenses of England.
- The Milford-Haven Experiments.
- The Lydd Experiments of 1886.

The Illustrated Naval and Military Magazine. March, 1888

- Military Bridges.
- Dogs in War.
- New Sea-going Torpedo Gunboat.
- Portable Railways for Field Purposes.
- The Russian Mountain Artillery Materiel.
- A New Armor-Piercing Projectile.
- The Haversack.
- [The same, April, 1888.]
- Inventions Applicable to the Services.
- A New Torpedo Indicating Light-Gear.
- The New Kruka Magazine Rifle.
- The French Sanitary Train.
- Europe in Arms.

Journal of the Royal United Service Institution. Vol. XXXI., No. 142.

Corrosion and Fouling of Iron and Steel Ships and Means of Preventing the same.
Machine Guns: Their Tactics and Equipment.
A French View Upon the Training of Their Infantry.

ITALY.

Revista di Artiglieria e Genio. January, 1888.

Some Propositions Regarding Field Artillery.
Concerning Military Ordnance in Relation to Civil Progress and Armaments.
The Refurnishing of Ammunition on the Battle Field,
Italian Field Artillery.
A New Torpedo.
[The same, February, 1888.]
Repeating Arms. Study of Repeating Arms, Made in Austria.
Report of a New Breech-Loading Carbine for the Arming of Troops in Africa.
Artillery Experiments on the Coast of Toulon, France.
Rapid Firing with Cannon of Large Caliber.
The Hydraulic Gun Carriage.

SPAIN.

Memorial de Artilleria. January, 1888.

A Study Upon Gunpowder.
Program of Drills and Practical Schools for the Government of Sieges.
Proposed Mechanism for Breech-block for Heavy Artillery.
[The same, February, 1888.]
Experiments With Guns Made in 1871.
Organization of the Batteries.
Tactical Questions.
[The same, March, 1888.]
Report Upon Incendiary Projectiles.
Notes Upon the System and Methods of Instruction at the Artillery Schools.
Photography and the Movements of Projectiles.
Experiments With Projectiles Loaded With Nitro-Glycerine.

UNITED STATES.

The Century. March, 1888.

Abraham Lincoln: The Call to Arms.
Russian State Prisoners.
Colonel Rose's Tunnel at Libby Prison.
Franklin's Home and Host in France.
The Home Ranch.
[The same, April, 1888.]
The Russian Penal Code.
Abraham Lincoln: The National Uprising.
The American Inventors of the Telegraph.
Memoranda of the Civil War.
[The same, May, 1888.]
Abraham Lincoln: The Border States.
The Personality of Leo XIII.
The Chances of Being Hit in the Battle.
The Locomotive Chase in Georgia.
Sheriff's Work on a Ranch.

The North American Review. March, 1888.

Judas the Iscariot.
The President's Puzzle—The Surplus.
Increase of the Standing Army.
Contraction and the Remedy.
[The same, April, 1888.]
The Hohenzollern Kaiser.
Burning of Columbia.

Possible Presidents: General Sherman.
 [The same, May, 1888.]
 Mr. Matthew Arnold on America.
 The Theory of American Government.
 Reasons for Accepting the Presidency.
 Germany's Right to Alsace.
 Testimony before House Committees.

St. Nicholas. March, 1888.

An Ancient Haunt of Pirates.
 The People We Meet.
 [The same, April, 1888.]
 Drill: A Story of Schoolboy Life.
 [The same, May, 1888.]
 Two Little Confederates.

The Forum. March, 1888.

Our Political Prospects.
 What shall the Public Schools Teach?
 Hinderances to Surplus Reduction.
 From Rome to Protestantism.
 [The same, April, 1888.]
 Civil Government and the Papacy.
 What shall the Public Schools Teach?
 The Union of English-speaking People.
 The Dawn of Electricity.
 [The same, May, 1888.]
 Miscarriages of Justice.
 Obstacles of Good City Government.
 National Control of Railways.
 Steam and its Rivals.

Magazine of American History. March, 1888.

Historic Cannon Balls and Houses.
 Captain Silvester Salisbury.
 Escape of Grant and Meade.
 [The same, April, 1888.]
 The Fallacy of 1860.
 Conquest of the Maxas.

The Pennsylvania Magazine of History and Biography. January, 1888.

Comte de Broglie, the Proposed Stadtholder of America.
 Letter of General Nathaniel Greene.
 William Penn's Plans for a Union of the Colonies.
 The Federal Constitution of 1787.
 [The same, April, 1888.]
 Letters of General James Wilkinson addressed to Dr. James Hutchinson.
 Sir William Keith.
 New York and Philadelphia in 1787.

Transactions of the American Society of Civil Engineers. October, 1887.

Discussion on the Kentucky and Indiana Bridge.
 Replacing the Stone Towers of the Niagara Railway Suspension Bridge with Iron Towers.
 [The same, November, 1887.]
 Portland Cement Testing.
 The Venturi Water Meter.

The Railroad and Engineering Journal. March, 1888.

Russian Railroads in Asia.
 A New English Torpedo Boat.
 United States Naval Progress.
 The English 111-ton Gun.
 Formulæ for the Resistance of Iron and Steel.
 Engines of a New Dutch Gunboat.
 [The same, April, 1888.]
 The Italian Battle-Ship "Italia."
 The Navy and Coast Defenses.

Outing. March, 1888.

- Big Game Hunting in the Wild West.
- A Texan Adventure with Pirates.
- [The same, April, 1888.]
- [The same, May, 1888.]
- Big Game Hunting in the Wild West.
- The Old Knapsack.
- Nature's North Point.

Journal of the U. S. Cavalry Association. March, 1888.

- Some German Ideas on Cavalry.
- Remounts.
- The Use of Arms, Mounted.
- Sabers or Revolvers?
- Devices for Effective Mounted Firing with the Pistol or Carbine.
- Marching Cavalry.
- Mounted Fire Action of Cavalry.
- Dismounted Service of Cavalry.
- The French Cavalry.

Bulletin of the American Geographical Society. September, 1887.

- New Mexico: Its Geographical Scenes and Peoples.
- Stone-Pasha's Work in Geography.
- Recent Explorations in Egypt.
- A Reconnaissance of the Greenland Inland Ice.
- A Year Among the Esquimaux.
- [The same, March, 1888.]
- Recent Geographical Work of the World.
- Ancient Cities of America.
- Commercial Geography of the American Inter-Oceanic Canal.

Popular Science Monthly. March, 1888.

- Underground Waters as Social Factors.
- Our Ice Supply and its Dangers.
- The Indians of British Columbia.
- [The same, April, 1888.]
- College Athletics and Physical Development.
- Forms and Failures of the Law.
- The Chemistry of Underground Waters.
- [The same, May, 1888.]
- Sound Signals at Sea.
- Future of the American Indian.

Scribner's Magazine. March, 1888.

- The Campaign of Waterloo, I.
- The Electric Motor and its Applications.
- [The same, April, 1888.]
- The Campaign of Waterloo, II.
- The Center of the Republic, I.
- [The same, May, 1888.]
- Modern Explosives.
- The Center of the Republic, II.

Proceedings of the United States Naval Institute.

- The Naval Use of the Pneumatic Torpedo Gun.
- Notes on the Naval Brigade.
- The Resistance of Air to the Motion of Projectiles.
- Our Naval Reserve and the Necessity for its Organization.
- Aluminum Bronze for Heavy Guns.

"Ours." March, 1888.

- The Siege of Williamsburg.
- Eminent Frontier Generals.
- The National Guard Association.
- [The same, April, 1888.]
- How the National Guard and the Army can aid each other.
- Our Adjutant-Generals.

Monthly Weather Review. December, 1887.

January, February.

Harper's New Monthly Magazine. March, 1887.

The Empress Eugenie and the Court of the Tuileries.

Studies of the Great West, I.

An Unknown Nation.

[The same, April, 1888.]

Studies of the Great West, II.

The Leavenworth School.

[The same, May, 1888.]

Studies of the Great West, III.

Justice and Law in Russia.

Political Science Quarterly. March, 1888.

State, Statute and Common Law.

The Bases of Taxation.

The Tariff of 1828.

Laband's German Public Law.

Johns Hopkins University Publications.

Johns Hopkins University Circulars. February, March, April, 1888.

European Schools of History and Politics.

The American Journal of Philology. December, 1887.

American Chemical Journal. March, 1888.

American Chemical Journal. April and May, 1888.

Science. Nos. 267 to 280.

Book Chat. (New York). To date.

The Public Service Review. (New York). To date.

The Book Mart. (Pittsburgh). To date.

ERRATA.

(In JOURNAL of March, 1888.)

- Page 3, line 14: *were* instead of "ware."
 3, line 26: omit *the* before "St. Regis."
 3, line 36: insert *and* before "connecting," and a comma (,) after "rivers."
 8, in table: "Cavalry Artillery" should be *Heavy Artillery*.
 11, in last two lines *s* should be *n* in *Pins*.
 13, in line 29, "*bags*" should be *baggage*.
 19, in line 32, small *t* instead of capital in *troops*.
 19, in line 31, omit final "s" in "conditions."
 19, in line 34, *Montana*, should read *Montana*.
 21, in line 37, omit the word "*four*."
 25, in line 11, the word "manufacturers" should be "manufactures."
 27, in line 2, omit final *s* in *sometimes*.
 31, in List of Authorities:
 In No. 47, 1870 should be 1878; and Saguénay instead of "Saguendy."
 In No. 51, should read: "Farrow's Military Encyclopædia."

THE MILITARY SERVICE INSTITUTION.

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Memorandum.

The Military Service Institution has published the thirty-fourth number of its Journal of Transactions: containing the Prize Essays and other Papers submitted to the Institution; an account of its Origin and Progress, and a Catalogue of the Museum. It offers a Gold Medal and Life Membership annually, for the best Essay on a given theme. The War Department has authorized the occupation of commodious rooms on Governor's Island for its Library and Museum, and has ordered the Quartermaster's Department to transport, without expense to the Institution, contributions of books, trophies, or curious relics. The Institution corresponds and exchanges publications with the principal military societies at home and abroad.

Membership and Dues.

(1) "All Officers of the Army and Professors of the Military Academy shall be entitled to Membership *without ballot* upon payment of the Entrance Fee."

(2) "Ex-Officers of the Regular Army, in good standing and honorable record, shall be eligible to full Membership of the Institution, *by ballot* of the Executive Council."

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All persons eligible for Membership are urged to join at once, and are urged to recruit for an Institution which has the Military interests of the country at heart.

"An Entrance Fee of Five Dollars (\$5) shall be paid by each member and Associate Member on joining the Institution, which sum shall be in lieu of the dues for the first year of membership, and on the first day of each calendar year thereafter a sum of not less than Two Dollars (\$2) shall be paid at annual dues. Annual dues commence on January 1st in each year, and are paid in advance."



PRIZE ESSAY—1887.

I.—The following Resolution of Council is published for the information of all concerned :

Resolved, That a Prize of a Gold Medal of suitable value, together with a Certificate of Life Membership, be offered annually by THE MILITARY SERVICE INSTITUTION OF THE UNITED STATES for the best essay on a military topic of current interest ; the subject to be selected by the Executive Council and the Prize awarded under the following conditions :

1. Competition to be open to all persons eligible to membership.*
2. Each competitor shall send three copies of his Essay in a sealed envelope to the Secretary *on or before September 1, 1888*. The Essay must be strictly anonymous, but the author shall adopt some *nom de plume* and sign the same to the Essay, followed by a figure corresponding with the number of pages of MS. ; a sealed envelope bearing the *nom de plume* on the outside, and enclosing full name and address, should accompany the Essay. This envelope to be opened in the presence of the Council after the decision of the Board of Award has been received.
3. The Prize shall be awarded upon the report of a Board consisting of three suitable persons chosen by the Executive Council.
4. The successful Essay to be published in the Journal of the Institution, and the Essay deemed next in order of merit shall receive honorable mention, be read before the Institution, or, at the discretion of the Council, be published.
5. Essays must not exceed twenty thousand words, or fifty pages of the size and style of the Journal (exclusive of tables).

II.—The Subject selected by the Council for the Prize Essay of 1887, is—

“ORGANIZATION AND TRAINING OF A NATIONAL RESERVE FOR MILITARY SERVICE.”

III.—It is announced, further, for the information of competitors, that this subject is “to open, for discussion, the general question of how a National Reserve force should be organized, and how it should be trained by Annual Maneuvers with the Regular Army, or otherwise, for immediate Service.”

IV.—Due announcement will be made of the composition of the Board of Award.

THEO. F. RODENBOUGH, *Secretary*.

GOVERNOR'S ISLAND, N. Y. H., *Nov., 1887.*

* “All officers of the Army and Professors at the Military Academy shall be entitled to membership, *without ballot*, upon payment of the entrance fee. Ex-officers of the Regular Army of good standing and honorable record shall be eligible to full membership of the Institution *by ballot* of the Executive Council.

“Officers of the United States Navy and Marine Corps shall be entitled to membership of the Institution *without ballot*, upon payment of the entrance fee, but shall not be entitled to vote, nor be eligible to office.

“All persons not mentioned in the preceding sections, of honorable record and good standing, shall be eligible to Associate Membership *by a confirmative vote* of two-thirds of the members of the Executive Council present at any meeting, *provided*, however, that the number of these Associate Members shall be limited to two hundred. Associate Members shall be entitled to all the benefits of the Institution, including a share in its public discussions, but no Associate Member shall be entitled to vote or be eligible to office.”

NOTICE TO MEMBERS, M. S. I.

AT a meeting of the Executive Council of the Military Service Institution, U. S., held at Governor's Island, N. Y. H., January 23d, 1888, the following resolution was adopted, and ordered to be printed for the information of members:

* * * * *

"RESOLVED, That the publications of the Institution shall not be furnished to members whose dues are in arrears for one year.

* * * * *

THEO. F. RODENBOUGH,
Secretary.

A True Copy,
E. R. HILLS,
Assistant-Secretary.

MEMORANDUM.

AT a meeting of the Executive Council of the Military Service Institution, held at Governor's Island, N. Y., May 12, 1888, the following Resolutions were unanimously adopted :

* * * * *

Resolved (1) That an invitation to read a paper before the Military Service Institution, or a request for a copy of the manuscript in a resolution of thanks, after the reading of such paper, shall not be construed to imply that it will be printed in the JOURNAL. The space is limited, and the Publication Committee is held responsible that it is filled to the best advantage from all material on hand. To this end the Committee is empowered to use its discretion in the selection of articles, and in the elimination from any article so selected of whatever shall seem objectionable from whatever cause.

(2) That the printing of monographs in advance of, or in lieu of, a regular appearance in the JOURNAL, be discontinued, but that the Publication Committee be authorized to print, in pamphlet form, extra copies of such articles as are likely to command a sale in that shape.

(3) That the price of the JOURNAL be raised from fifty cents to seventy-five cents per copy.

A TRUE COPY.
E. R. HILLS,
Asst. Secretary.

THEO. F. RODENBOUGH,
Secretary.

DIED

at

FORT ELLIOTT, TEXAS,

May 23, 1888,

George Francis Price,

CAPTAIN FIFTH CAVALRY.

Gold Medallist and late Treasurer M. S. I.
